A Landscaped Architecture for Hawai`i:
Strategies for Designing with Natural Systems

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We certify that we have read this Doctorate Project and that, in our opinion, it is satisfactory in scope and quality in fulfillment as a Doctorate Project for the degree of Doctor of Architecture in the School of Architecture, University of Hawai`i at Mānoa.

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ABSTRACT

The burgeoning sustainability movement is the beginning of a new era for design. This thesis explores the ways in which natural elements can be more sensitively and intentionally integrated into the built environment as a way to progress sustainability goals. The first three chapters of this thesis describe the role of natural systems for three vital characteristics to lasting architectural expression: function, form, and meaning. Function is enhanced by an ecological cooperation with the local environment; form is driven by aesthetic innovation that enriches psychologically imperative sensory stimulation; and meaning is derived from a connection to a place specific cultural heritage and value system. There is then an examination of contemporary expressions in 'green' architecture that have integrated natural elements more fully on, in, or around the built environment, in what this author has called a 'landscape architecture'. Through a multi-disciplinary and multi-angled approach, the author has sought to identify themes underlying an increased integration of natural and built environment to serve as guiding principles for design professionals in Hawai`i.

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PREFACE

With a subject as vital and all-encompassing as the discussion of sustainability, it is virtually impossible to cover all facets of the issue. Sustainability is an issue that involves all aspects of society, and will necessitate research and innovation in all fields. Within this thesis, I have attempted to discuss ways in which to more successfully integrate natural elements within the built environment of Hawai`i as a contribution towards this larger societal goal. In it there is discussion of how to make architecture more appealing, meaningful, and functional for human and environmental health through the use of a deeper understanding and connection to local ecological systems. What have not been included are other aspects of this issue relevant for the architectural profession. Two such aspects that are immediately apparent have to do with very practical, real world issues that must change for the measures within this thesis to become more prevalent: cost and codes. Certainly the cost of any project is of utmost importance in today's construction industry, as is the challenge of passing innovative ideas through bureaucratic and political red tape. Their omission in this thesis is not meant to downplay the importance of these issues, but rather because they each necessitate thorough research in their own right. The hope of this author is to suggest ways in which ecologically based sustainability strategies can be implemented in a desirable way in order to encourage mass support for the movement. Large scale purchasing power can create a wave of change that can propel once avant garde strategies into accepted norms. There has already been a generation or two of forward thinkers who have inspired a sustainability movement that has now gained enough momentum to institute change on a large societal scale. The contemporary architectural profession now has the opportunity to fulfill their legacy in this next era of built environment. The formal articulation of environmentalism is the next stylistic movement and will ultimately have the potential to help the sustainability movement to either succeed or fail. This author hopes to help contribute to this future of sustainability for Hawai`i.

INTRODUCTION : A LANDSCAPED ARCHITECTURE

Sustainability is the principle topic for innovative design in the foreseeable future for human civilization. The topic of sustainability has been building from the environmentalist movement since the 1960's, now reaching a critical point for all industries in modern society. Environmentalism is based on the basic reality that society is reliant on a natural environment that is quickly being destroyed and that mankind is now at a decisive moment in evolution when civilization must rethink its mechanisms to work with the environment, so that it is not degrading natural systems, but working within them, enriching and being enriched by them. As can be seen by the ubiquitous, and perhaps overused, reference to 'sustainability', environmentalism has reached beyond a fringe proclivity of extreme liberals to become a significant societal movement. We are at the so-called tipping point for the recognition of environmentalism as the leading ideology for future human development.

Architectural design is certainly changing along with this larger societal movement. Although, what is meant by 'sustainable architecture' ranges greatly. At times it might refer to experimental structures built off-the-grid with only locally harvested natural materials. Alternatively it might refer to buildings of typical construction that have simply been altered slightly to include energy efficiency strategies. These are two ends of a sort of sustainable design spectrum, with complete disavowal of standard construction strategies on one side and ineffective token gestures to sustainability on the other. The range of ways in which an architect might utilize sustainability principles is so broad that it is hard to pinpoint what sustainable architecture actually is.

There are third party certification organizations, such as LEED and the Living Building Challenge that have been developed to determine frameworks and guidelines for designers, creating a sort of instruction manual for the design process of sustainable

architecture. Alongside these practical application manuals, there are also more theoretical manifestos being written by architects such as William McDonaugh and Bill Reed about the philosophical and ideological goals of the sustainable design movement. These contemporary publications are among a plethora of earlier works from many disciplines and angles, which have been building a strong foundation for the ideology of environmentalism and sustainability. Out of this ideological groundwork, there are many design movements working on the ways in which the ideas of environmentalism are made into reality in the physical artifacts of society. A common theme for this type of design is the use of ecological thinking as a way to more closely unite architecture with nature. With design movements such as Biophilic Design, Biomimicry, Regenerative Design, Permaculture, and Ecodesign, architects are looking to nature, and the patterns and ecosystems of local ecology, as a way to more sensitively site architecture and include its systems within a cycle of mutually beneficial relationships with nature.

In many contemporary architectural examples, this desire to reunite architecture with nature and incorporate an ecological understanding into the design has resulted in a blending of landscape and architecture, where natural elements and vegetated surfaces are woven within, on and around the architecture. It is reinterpreting the relationship of landscape to architecture, so that they are not two complementary but separate design elements, but rather merged together. A few decades ago this included interiorscaping – bringing gardens and plant beds into the interior, but has continued in more recent times as an actual element of the building itself. With the rise in green roofs, vertical gardens, and living machines, natural elements are increasingly becoming an integrated part of the architecture, whether structurally, mechanically, or as a part of the façade. This new 'landscaped architecture' is a manifestation of the ideals behind the sustainability movement, where interest in 'green' issues has resulted in a literal 'greening' of the building. These contemporary landscaped architectural projects are increasing in number and happening across the globe. Examples can be found on every continent, in every contemporary design magazine, and by a wide range of international

architects. It is the advent of a new era for design, moving past the supremacy of modernism that has captivated architecture for so long, and introducing a new formal language based on environmentalism. In many ways, this new visual language is showcasing a trend that could create the aesthetic appeal necessary to integrate sustainable natural systems on a broad scale into the built environment and represents an exciting opportunity for designers to express the values of this environmentalist era in the lasting monument that is architecture.

0.1 A Landscaped Architecture: Trend or Movement

What remains to be seen is if this developing design language of landscaped architecture is simply a trend or if it will develop into a lasting design solution for environmental design. Certainly every design typology has the potential to either succeed or fail in exemplifying the ideology behind its inception. The question is in what ways a landscaped architecture may or may not further the goals of the sustainability movement.

Architecture is an interesting art form for humanity in that it must simultaneously embody function, form, and meaning to create a truly lasting testament to both the need at its creation as well as to survive as a valued monument for future generations. It must serve as a useful space, both in spatial flow and with its mechanical systems, while also creating a form that is beautiful, fits within its context and carries the significance of the time and culture it represents. If a landscaped architecture is to last as more than a momentary trend in architectural history, it must be able to address these three basic facets of good architecture. First, it must mechanistically work to fulfill the needs of both the human inhabitants and the local environment. Secondly, it must intrigue the senses for both aesthetic appeal and for emotional and psychological well being. Thirdly, it must reference the local culture's traditions, values and goals in

order to give the built environment a resonating sense of place, creating a level of significance that instigates local pride and accountability.

0.2 Function : Ecological Participation

Functionally speaking, there has been much important research achieved as to how to create sustainable architectural solutions utilizing natural systems. We know the mechanics of how to build components of an ecologically responsive architecture, with new solutions imitating nature being found every day. From simple passive design solutions, to complex ecosystem design with living machines, natural solutions are being developed to manage the full range of human mechanical requirements. Some examples of the utility that may be handled with natural systems include: water catchment, biofiltration of sewage, passive design for natural lighting and space conditioning, phytoremediation, purification of air and water, food production, insulation and much more. Increasingly, humans are finding ways in which natural elements can contribute to, or completely replace, the system requirements in the built environment.

Individually, each of these natural systems has the potential to replace a mechanical need within the built environment, but a whole systems approach is needed to incorporate these natural systems as a replacement for most if not all of the mechanical functions within the built environment. Thus far, ecologically responsive systems within the built environment have been additive – an individual component inserted as an appendage to the architecture. Ecological systems are complex, because they are comprised of living entities, each with their own unique needs and outputs, continually interacting in a series of relationships in flux. The incorporation of natural systems for functional architectural requirements must respond to this complexity through a system with multiple relationships to the local ecology, wherein the building

is an active participant in the environmental makeup, feeding and being fed by the surrounding environment.

0.3 Form : Aesthetics and Well-being

While there has been a plethora of work on the functional aspects of sustainable architectural design, there has been a decided lack of work on what this type of architecture should look like, other than to say that it should be appealing. The next step towards helping sustainable strategies to become realized on a large scale is for architects to change design strategies so that these systems not only mechanistically function, but also intrigue aesthetic preferences. It is only once people see these natural system strategies as desirable that they will be adopted wide spread. It is an opportunity for the advent of a new era in design, one in which beautiful and innovative architectural forms are driven by the integration of natural elements.

Interestingly, this is arising simultaneously with society's increasing yearning for a reconnection with nature. The distance that has been placed between the built environment and natural surroundings has created a negative impact to the physical and psychological well being of humanity. It has been shown that interaction with natural elements increases happiness, health, efficiency, and productivity for human habitants. The use of natural elements as the aesthetic design inspiration is then vital for both the health of the environment and for mankind.

0.4 Meaning : Cultural Responsiveness

A closer consideration of environmental concerns demands custom solutions for every location, tailored to the particular climatic conditions and ecological makeup of the local environment. Equally important is the cultural relationship to nature and the ways in which tradition, values, and creative expression are uniquely revealed in the

local relationship of natural and built environment. A sense of place is created through the balance of local cultural and natural assets, creating a distinct identity in time and space. An affinity is created for the architecture that speaks of the needs, values, and goals of a culture in its time, which leads to a sense of pride, accountability, and longevity. For the future of an ecological design, it is vital to fully understand the cultural connection to flora, fauna, local climatic conditions, and also to incorporate the unique relationship of culture to nature within the design in order to instill a feeling of significance and engagement that relates to a lasting and loved architecture.

0.5 A Landscaped Architecture : Rise of the Environmentalist Design Language

By looking at sustainability design from this three point perspective, it becomes evident that the integration of ecological principles has the ability to improve architectural expression at all levels – mechanically, aesthetically, culturally. The local environmental landscape is not simply an accessory to architecture; it is the inspiration, the resource, and the fundamental partner. Sustainable design must be informed by this very basic realization: landscape is an essential part of architecture. The idea of architecture as an object in a landscape stays blind to the great potential of collaboration. The need is now for a more integrated design methodology wherein the landscape is an integral aspect to the designed space, no longer landscape and architecture, but rather a landscaped architecture.

How then does this new visual language of a landscaped architecture fit into the Hawaiian context? In an isolated island environment like Hawai`i, the urgency for self-sustainability is more imperative. Currently heavily dependent on imported goods and energy sources, Hawai`i is reliant on a system that requires an enormous amount of energy to maintain and is vulnerable to changing market prices and natural disasters. For both the health of the local environment as well as an increase in comfort for people on the islands, it is vital to redefine the relationship to the tropical ecology.

Summary : Literature Review

The academic work that addresses the need for a reconnection between the human built environment and the natural environment is varied, through both the disciplines addressing it, and through the ways they have contributed. Some have researched the use of the science of ecology to solve the functional concerns of the built environment; others have begun to address the psychological and emotional health connections associated with man's connection to nature; many have worked on the strong connection between culture and flora; and still others have simply documented the newest landscape architecture examples as a kind of eye candy for the industry. However, nobody has attempted to coalesce these varied approaches for the ways in which they document the dawning of a design era. The sustainability movement has become a ubiquitous driver for contemporary society and the disparate approaches to the ideology of this movement - whether functional, aesthetic, or cultural – are all contributing to the formation of an architectural embodiment of this ideology. My research utilizes each of these deep and specialized research pursuits to articulate the changing characteristics of the human-nature relationship in the built environment through a holistic inter-disciplinary approach as a way to define the themes of an emerging design paradigm shift. Through the specific cultural lens of Hawai`i, I have begun to identify the underlying principles and design strategies that are defining this new era of design.

CHAPTER 1 : ECOLOGICAL DESIGN

The most relevant subject for contemporary designers is the way in which the built environment can be made and maintained more sustainably. This goal entails a new mentality towards the relationship of the natural and built environments in which the systems that sustain the modern way of living, also positively maintain the systems of the local environment. Functionally speaking this means the two must work together in a cycle of beneficial relationships that support one another. The era of complex systems that fight the local environment is coming to an end. A reintegration with natural systems is the way to solve much of the required function of any built environment. The study of ecology holds much vital information for making this transition. A deeper understanding of the complex earth systems within which buildings must exist enables designers to innovate solutions that support the coexistence of life. By looking to the ecology of place, learning its lessons, and integrating cooperative relationships into buildings, the built environment can create living systems that enrich the environment and reunite mankind with the environment he depends on. The future for architecture is in this combination of ecological understanding and innovation towards human needs.

1.1 Origins of an Ecological Approach

The notion of an ecological design strategy immediately raises certain questions and limitations. What exactly is meant by ecological design? The word ecology is like so many other words in that it can refer to a variety of meanings depending on which discipline is using it. More than any other science, ecology and ecological principles have been utilized across many disciplines, acting as a sort of bridge between the

natural and social sciences.[1] The science of ecology is an interesting blend of other sciences, in which biology, chemistry, and physics are all used to gain a holistic understanding of the earth, its systems, relationships, forces, and life forms. It did not arise as an independent field of study until relatively recently in historical terms. The first recognized use of the word ecology was in 1869 by German biologist Ernst Haeckel, in which he defines ecology as "the study of the natural environment including the relations of organisms to one another and to their surroundings."[2] Haeckel was in fact responding to a growing interest in a whole systems approach to natural science studies being pursued in multiple disciplines, from botany to biology and especially evolutionists such as Charles Darwin.[3]

The unique part of ecology's history is that even at its onset it was heavily adopted and utilized by social scientists. Ecology was emerging as a comprehensive way of looking at living organisms as an interactive whole, rather than through the traditional reductionist focus of the natural sciences that concentrates study on individual components. The whole systems approach of ecology lent itself well to understanding the interdependent relationship between natural systems and human systems. The focus on the interrelationships of things, through an analysis of relationships and dynamic flows, lent itself greatly to broader social analysis as well as to analytic scientific analysis.[4]

A very influential force in the development of ecology was Howard W. Odum, a sociologist who studied human problems and the regional environmental issues linked to social reform, relying on the belief that "society and nature are inseparable."[5] It was

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[1] Eugene P. Odum and Gary W. Barrett. *Fundamentals of Ecology, 5th Edition*. (Brooks Cole, 2004), 3.
[2] Ernst Haeckel. Found in *Fundamentals of Ecology, 5th Edition*. By Eugene P. Odum and Gary W. Barrett. (Brooks Cole, 2004), 3.
[3] Biology Reference. *History of Ecology*. http://www.biologyreference.com/Dn-Ep/Ecology-History-of.html (accessed November 25, 2011).
[4] Edward J. Kormandy, "Ecology/Economy of Nature –Synonyms?" *Ecology*, Vol. 59, No. 6 (Autumn, 1978), 1292.
[5] Howard W. Odum. Found in "Ecological Theory Origin from Natural to Social Science or Vice Versa? A Brief Conceptual History for Social Work." By Karen Smith Rotabi. In *Advances in Social Work*. Vol. 8 No 1. (Spring 2007), 114.

Odum's belief that the relationships and interactions of a given environment was of the utmost importance when understanding the context for social behavior. In many ways, Howard Odum was forming a social ecology, looking at the person-to-environment relationship while the natural science of ecology was forming a comprehensive view of the interactions of natural elements. Odum's interests bridged between the sciences and the humanities[6], creating the groundwork for modern ecology.

Eugene Odum is commonly recognized as the father of modern ecology because of his seminal work *Fundamentals of Ecology* writing in 1953, clearly outlining for the first time the ideas and principles of an ecosystem ecology.[7] Eugene Odum's ecosystem model focused heavily on energy flow and the "study of the relationships between structure and function in nature."[8] It was a critical change for the science of ecology, because it saw the expansion of ecological knowledge from a utilitarian perspective on natural system documentation, to a sort of "bioeconomics" - a conservationist perspective with an "emphasis [on] the flow of goods and services."[9] Ecology was beginning to branch, with one side focusing solely on simple scientific query, and the other on the use of ecological understanding as a managerial method towards productivity, efficiency, and functionality goals.[10]

Again, this development within the more rigidly scientific natural science of ecology was joined by further development within the social sciences. A changing mentality towards nature was developing. The two sides of ecology were co-evolving towards an early environmentalist perspective. In 1949, ecologist Aldo Leopold began to develop a moral and ethical reasoning based on the social questions arising out of the

[6] Karen Smith Rotabi. "Ecological Theory Origin from Natural to Social Science or Vice Versa? A Brief Conceptual History for Social Work." In *Advances in Social Work*. Vol. 8 No 1. (Spring 2007), 114.
[7] Karen Smith Rotabi. "Ecological Theory Origin from Natural to Social Science or Vice Versa? A Brief Conceptual History for Social Work." In *Advances in Social Work*. Vol. 8 No 1. (Spring 2007), 116-117.
[8] Eugene P. Odum. "Energy Flow in Ecosystems: A Historical Review" American Zoologist, Vol. 8, No.1 (February, 1968), 11.
[9] Edward J. Kormandy, "Ecology/Economy of Nature –Synonyms?" *Ecology*, Vol. 59, No. 6 (Autumn, 1978), 1293.
[10] Edward J. Kormandy, "Ecology/Economy of Nature –Synonyms?" *Ecology*, Vol. 59, No. 6 (Autumn, 1978), 1293.

development of ecological ideas. In his book A *Sand County Almanac,* he was the first to question the industrial mentality towards nature. Within it, he developed the idea of a land ethic: a different way to understand man's relationship to nature, transitioning from an imperialistic view of nature to a cooperative, conservationist view.[11] He introduced nature as an ethical dilemma, recognizing that there was not yet an established system of values for man's relationship to nature, and thereby initiated a moral code for man's interaction with the land.

> All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in that community, but his ethics prompt him also to co-operate (perhaps in order that there may be a place to compete for). The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.[12]

Leopold was in effect creating a set of standards for behavior in relation to the natural environment, something that had not entered the societal context in any documented way before. It helped articulate how one ought to live and why environmental awareness was important, creating an ecological consciousness for a society and preparing the way for a modern environmental movement.[13]

The strong connection of the natural and social sciences of ecology only increased as the ethical implications of an ecological understanding were adopted by the environmentalist movement of the populous rising in the 1960's. Mass support for environmentalism was heavily influenced by another writer, Rachel Carson, with her book *Silent Spring*. Carson was a scientist who also had a penchant for writing. Her own personal research led her to discover of the horrible effects of the industrial era and the detriments of pollution.[14] Through her clear and poignant writing style, she was able to

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[11] Edward J. Kormandy, "Ecology/Economy of Nature –Synonyms?" *Ecology*, Vol. 59, No. 6 (Autumn, 1978), 1293.
[12] Aldo Leopold. *A Sand County Almanac and Sketches Here and There*. (Oxford: Oxford University Press, 1949), 203.
[8] The Aldo Leopold Foundation, *Leopold's Land Ethic*. www.aldoleopold.org (accessed September 12, 2011).
[14] Linda Lear. Introduction to *Silent Spring* by Rachel Carson. (Boston: Houghton Mifflin, 1962), xi-xiii.

articulate to the mainstream population how modern industrial practices, with their complete disregard for nature or the effects of indiscriminate chemical usage, was not isolated to their intended targets, but increasingly damaging human environments and therefore human health. "These sprays, dusts and aerosols are now applied almost universally to farms, gardens, and homes . . .Can anyone believe it is possible to lay down such a barrage of poisons on the surface of the earth without making it unfit for all life?"[15] She was able to create a widespread understanding of the ecological principles developing in the sciences, a significant step for greatly encouraging the growth of the environmentalist movement.

In a large part due to the fervor created by Carson's book, the United States soon after passed the National Environmental Policy Act in 1969 and celebrated the first Earth Day in 1970, showcasing the rising interest in environmental awareness.[16] The National Environmental Policy Act has been referred to as "an ecological 'Magna Carta'"[17] for the extensive impact that the legislation has had on growth and development within the United States. Once the legislation passed, ecological principles started to be used to assess environmental impacts in almost every industry. It was the sign that governmental awareness was catching up to both scientific and popular beliefs about the importance of the relationship between mankind and the environment.

Not long after, another important text originated that articulated a scientific approach to the environmentalist mentality with strong spiritual and metaphysical undertones: *Gaia, a New Look at Life on Earth* by James Lovelock. The Gaia hypothesis is a theory expanding upon the holistic living systems approach of ecology, describing all of earth as one being – a self-created, self-regulating, and perpetually interactive whole. As he explains, Gaia is:

> the hypothesis that the entire range of living matter on earth, from whales to viruses, and from oaks to algae, could be regarded as constituting a single living

[15] Rachel Carson. *Silent Spring*. (Boston: Houghton Mifflin, 1962), 7-8.
[16] Linda Lear. Introduction to *Silent Spring* by Rachel Carson. (Boston: Houghton Mifflin, 1962), xviii.
[17] Stanley I. Auerbach. "Ecology, Ecologists and the E.S.A." *Ecology*, Vol 53, No 2 (March 1972), 205.

> entity, capable of manipulating the Earth's atmosphere to suit its overall needs and endowed with faculties and powers far beyond those of its constituent parts . . . the Earth's atmosphere is actively maintained and regulated by life on the surface, that is, by the biosphere.[18]

This theory brought the study of ecology to its furthest conclusion, essentially linking all activity on earth, suggesting a larger connectivity and therefore chain of cause and effect than had been presented by the scientific community before. By taking the whole systems approach to an extreme, Lovelock united mankind with nature to a total degree, suggesting that we were not many individual entities interacting, but rather many parts to one larger being. It touched many people's sense of spirituality, with the feeling that every living thing is connected to a larger whole. It was also in stark contrast to the mentality of nature as something wild that needed to be controlled, manipulated or subdued. Lovelock was claiming that humanity is inherently a part of nature and therefore an oppositional or separatist attitude could create a misbalance unfavorable to continued existence. His work evidenced a rising cultural trend connecting scientific evidence with a spiritual implication, allowing for a new perception of mankind's relationship to nature. The term Gaia has since become ubiquitous in environmental texts, whether disregarded or celebrated for its metaphysical leanings.

The environmentalist movement thus took the term ecology to an extreme degree of commonality, where it is now appropriated liberally as a term referring to environmental awareness. In a speech given by Stanley Auerbach in 1972 as he was retiring from the presidency of the Ecological Society of America, he noted,

> What about ecology? In the last three years this term has achieved a degree of fame (or notoriety) far exceeding our most extravagant hopes and dreams of a decade or more ago. . . On the one hand, this frenetic crescendo at times has the symptoms of babble, on the other it reflects a deeper, much more pervasive note of social concern. The 'environmental crisis' is a manifestation of the growing public recognition of the need for an ecological ethic.[19]

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[18] James Lovelock. *Gaia: A New Look at Life on Earth*. (1979; Rev ed., Oxford: Oxford University Press, 2000), 9.
[19] Stanley I. Auerbach. "Ecology, Ecologists and the E.S.A." *Ecology*, Vol 53, No 2 (March 1972), 205.

The many levels of what 'ecology' came to mean - scientifically, ethically, spiritually – were laying the intellectual groundwork for the practical changes that needed to occur in the ways in which humans and societies behave. The work was then developing how these ideas of ecology were practically employed within mankind's day-to-day occupations.

The practice of an ecological understanding within modern culture arose early in the profession that deals most intimately with the land – farming. Farmers such as Masanobu Fukuoka were developing a kind of applied ecology in practice, where an understanding of ecology could be used as a management system for production. In his book *The One-Straw Revolution*, Fukuoka describes the development of his influential 'Do-Nothing' style of natural farming - a non-cultivation farming method that closely mimics the natural growth patterns of wild plants, where one farms by "cooperating with nature rather than trying to 'improve' upon nature by conquest."[20] Through years of trial and error, Fukuoka was able to develop a natural method of farming rice that used the output of one natural process to feed the input needs of another natural process, and so on, in a self-regulating cycle. This method yielded as much food as comparable mechanized farms, and actually improved the fertility of the soil.[21] It was a sustainable system, designed towards human needs and desires, by creating self-perpetuating relationships similar to those found in wild ecosystems. Fukuoaka's ideas, both the scientific understanding as well as the social and moral understanding, were helping to pioneer a new way of thinking about production, a shifting mentality for the farmer and for the way in which we grow our food. His book not only outlines the techniques behind his farming methods, but also strongly encourages a philosophy for life – one that is significantly more observant and responsive to the local environment. As he points out, "Ultimately, it is not the growing technique which is the most

[20] Larry Korn, Editor's Introduction to *The One –Straw Revolution*, by Masanobu Fukuoka. (NY: New York Review Book, 1978), xx.
[21] Larry Korn, Editor's Introduction to *The One –Straw Revolution*, by Masanobu Fukuoka. (NY: New York Review Book, 1978), xxiv.

important factor, but rather the state of mind of the farmer."[22] In many ways, farmers such as Fukuoka were the first in modern times to create and live within a cyclical and responsive natural human ecosystem, a style of utilizing ecological principles in a way of managing environments towards human goals.

The natural farming movement was also the origin of Permaculture, an approach to designing human settlements and agricultural systems that are modeled on the relationships found in natural ecologies. Originally based off the farming practices of Austrian farmer Sepp Holzer,[23] the permaculture method was made into a comprehensive design strategy for human habitations by Bill Mollison and David Holgren in the 1970s. Originating from the idea of 'permanent agriculture', permaculture began as an agricultural technique based on the idea of creating enriching and self-regulating systems modeled on naturally occurring community ecologies.[24] Similar to Fukuoka's Do-Nothing Farming, Permaculture seeks to utilize ecological principles as a managerial strategy for creating environmentally sustainable systems for human benefit. What was revolutionary about permaculture was that it began to include more than simply agricultural issues within the environmentalist mindset, recognizing that all cultural practices are contributors to an ecological footprint and therefore a truly sustainable society needs to create a complete paradigm shift. It grew to include the idea of 'permanent culture', taking the values and ethics of the permaculture design system to all aspects of society, thus becoming an all-inclusive design system for sustainable human existence. Ultimately, it is a systems based approach where a settlement is created in cooperation with the local ecology of place so that all needs are met and managed in a cyclical flow of beneficial relationships arrived at from the values and ethics attending, "a sense of personal responsibility for

[22] Masanobu Fukuoka. *The One-Straw Revolution*. (NY: New York Review Book, 1978), 46.
[23] Uleshka Asher. "Sepp Holzer: A Permaculture Worldchanger" *Worldchanging: Change Your Thinking*. May 28, 2010. http://www.worldchanging.com/archives/011217.html (accessed December 7, 2011).
[24] Bill Mollison. *Permaculture: A Practical Guide for a Sustainable Future*. (Washington, D.C.: Island Press, 1990), 1.

earth care."[25] In many ways, Permaculture took the ecological theory within the environmentalist movement to a holistic cultural level, spelling out clear methods for putting into practice the changes necessary for the paradigm shift to a truly sustainable society.

As showcased in these applied practices, ecology has become influential in a multitude of scenarios. It's origin in the sciences still holds true to the qualitative imperial rationale of any rigorous scientific pursuit, yet ecology has come to mean much more than this. It has always been useful in the social sciences as a way of understanding man's relationship to his environment, and it has now led to an applied practice of environmental management strategies. Ultimately, ecology is the study of the earth: its systems, organisms and relationships. In our modern day push towards sustainability, this study lends itself as a mechanism to both define and inspire solutions to the skewed systems that have brought society to its current environmental crisis. "The ecological ethic of interdependence may be the outcome of . . . a dialectic between scientist and moralist .... Ecological biology, while in general reinforcing certain values more than others, has been and remains intertwined with many of man's ethical principles, social aims, and transcendental ambitions."[26] This then serves as a sound theoretical and practical basis for design solutions.

1.2 Origins of Ecological Design for Architecture

According to the most basic definition, ecology is, "the branch of biology dealing with the relations and interactions between organisms and their environment, including other organisms."[27] From this foundational perspective, the use of ecology for architectural design is then the ways in which biological relationships and interactions

[25] Bill Mollison. *Permaculture: A Practical Guide for a Sustainable Future*. (Washington, D.C.: Island Press, 1990), 1.
[26] Edward J. Kormandy, "Ecology/Economy of Nature –Synonyms?" *Ecology*, Vol. 59, No. 6 (Autumn, 1978), 1293.
[27] Random House Dictionary, s.v. "ecology", www.dictionary.com (accessed November 24, 2011).

can be utilized in the design of human environments. With this ecological base, architecture can be thought of as a biosystem - a system that contains both biotic (living) and abiotic (nonliving) components.[28] Architecture contains at the very least living humans within a construction of nonliving elements. However, the level of living complexity can potentially be greatly increased through the inclusion of living systems within the mechanics of the built environment's systems. The balance of biotic to abiotic may vary so that biotic elements may replace the roles traditionally held by abiotic elements. In this way, the architectural environment is more of a coexistence of living systems functioning together as unified whole.

In many regards, the father of an ecological design mentality for architecture is Buckminster Fuller. Scientist, philosopher, and designer, Fuller was a pioneer in the ways in which to think about resource usage for production. Perhaps best recognized for his technological innovations, particularly the geodesic dome, Fuller's philosophy strove towards the efficient and environmentally beneficial use of resources in design in order to benefit humanity.[29] As early as the 1920's Fuller predicted the environmental crisis that has been brought about by the mismanagement of resources.[30] His life work became the development of a utopian outlook for the future of earth where efficient uses of resources and technological innovations combined to sustain the environment in perpetuity and supply for the needs of all mankind.[31] He saw this potential through the elimination of the notion of waste. "Pollution is nothing but resources we're not harvesting. We allow them to disperse because we've been ignorant of their value."[32] He was articulating a basic ecological notion, in which elements of a system have inputs and outputs that contribute to the machinations of the whole. It is a cyclical view of supply and demand rather than a linear view of resource input and waste output. For

[28] Eugene P. Odum and Gary W. Barrett. *Fundamentals of Ecology, 5th Edition*. (Brooks Cole, 2004), 5.
[29] "Sailing Spaceship Earth: Buckminster Fuller's Environmentalism." Foresight Design Initiative : Let's Make It Sustainable. http://www.foresightdesign.org/events/detail.php?id=731 (accessed November 22, 2011).
[30] Barry Farrell. "The View from the Year 2000." *Life Magazine*. (February 26, 1971), 47.
[31] Lord Norman Foster. "Richard Buckminster Fuller." In Buckminster Fuller: Anthology for the New Millenium. Edited by Thomas T.K. Zung. (New York: St. Martin's Press, 2001), 3.
[32] Barry Farrell. "The View from the Year 2000." *Life Magazine*. (February 26, 1971), 51.

Fuller, environmentalism was not a doomsday prophecy, but an opportunity for designers. In many ways, he instigated a changing mentality towards how to think about design.

Another early innovator in using ecological principles for modern design challenges was John Todd. Working with The New Alchemy Institute, Todd was extremely influential for researching useful ways for natural systems to supply for functional needs within the built environment. He utilized a combination of biological research and architectural tectonics to create natural systems for human needs. Starting in the 1970's John Todd produced vital research on the creation of living machines, "a device made up of living organisms of all types . . . that function together in the performance of some type of work. . . They are designed along the principles evolved by the natural world in building and regulating its great ecologies."[33] The type of living machine that has become prevalent from this influential research was the use of constructed wetlands for the purpose of purifying black water. Through the creation of wetland ecosystems, raw human sewage was able to be filtered by feeding vegetation, participating in a mutually beneficial relationship of plant life and human life. In this system, there is no waste, simply a natural process of nutrient flows arranged to feed one another. The water that comes out of the living machines can be released onto the land for irrigation purposes, further supporting the human constructed environment and simultaneously renewing the ground water. It is also able to integrate with other water systems for the house, such as water catchment and storm water management. The term 'living machine' has since been patented for a specific design of constructed wetland water purification,[34] but the idea has spread and expanded, now incorporated in regions worldwide. It was the early articulation of a functional incorporation of natural systems to fulfill the needs within a modern built environment.

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[33] Nancy Todd and John Todd. *From Eco-Cities to Living Machines: Principles of Ecological Design*. Berkeley: North Atlantic Books, 1994), 167.

[34] http://www.livingmachines.com/?gclid=CITP2oizr6wCFeoZQgodMglmGw

These early pioneers of an interdisciplinary design methodology were critical in the realization of the practical application of ecological principles as architectural solutions. Their adoption of an inter-disciplinary approach to design enabled them to redefine the relationship of the natural and built environment from an oppositional struggle, to a positively participatory interaction of elements. The architectural community is still working towards the incorporation of these principles into the built reality, but much research and practical trial and error have resulted from the work initiated by those willing to combine architectural ideas with scientific knowledge of the environment.

1.3 Contemporary Ecological Design

Since these early beginnings, the architecture profession has increasingly absorbed the environmentalist mentality, producing a large strategic base for how to create environmentally sustainable architecture. With the astounding fact that today's buildings create approximately half of all of our greenhouse gasses,[35] as well as the increased consciousness of the limitation and high environmental cost of many of our building materials and construction techniques, architecture has struggled to change course and redefine design and construction. The concern for environmental issues in the architecture profession has increasingly relied on ecological principles to reinvent the built environment. It is evidenced in the rise of design movements likes Biomimicry, Biophilic design, Regenerative design, and Cradle-to-Cradle design. It is in the last five to ten years that these design methods have begun to define a new branch of environmental design thinking, based in some way or another on the idea of a living building.

[35] Daniel Pittet and Tejas Kotak, *Environmental Impact of Building Technologies* (University of Applied Sciences of Southern Switzerland, World Habitat Research Centre and Hunnarshala Foundation, Bhuj, Gujarat, India) 1. http://www.worldhabitat.supsi.ch/paper_Ecomateriales.pdf (accessed August 20, 2011).

So what is meant by the idea of a living building? This idea has been explored through many channels: as a systems-based approach, a biological and psychological approach, an aesthetic approach, as a third-party certification for standards of environmental design, and ultimately as a philosophical imperative. All of these explorations have begun to redefine architecture in an increasingly environmentally conscious culture by discovering ways in which the built environment can and must interact with the local ecology, whether literally bringing natural systems into the spatial or structural building components, or more indirectly through imitation and sensitive design application. Each of these design approaches are working to define this new attention to ecology, looking at the many ways that mankind can get closer to the land and closer to an understanding of nature so that we may create a more integrated relationship between the man-made and the natural. In this way, one can think of a living building as one that has active and beneficial relationships with natural systems, allowing for a healthy and evolving life for the human within a thriving ecosystem. By dubbing a construct as 'living', it also allows it to have more significance in the human consciousness, implying that it has a soul, a spirit, and therefore should be respected, fed, loved, and exist as part of a community.

This discussion arises out of the realization that the sustainability movement in architecture has not, up to this point, made sufficient changes to actually be sustainable. As many writers have pointed out, in our attempts to change building and manufacturing practices, we have simply gotten to a point where we are doing less damage, only slowing down the destruction of the natural environment.[36] While these changes may be important steps for our society as part of a process of conversion to sustainability, we have not yet reached a point where our production processes have ceased to do harm to our environment, nor are in a system of actual self-sustainability. Realizing the need for a next step in our development towards sustainability, there has

[36] Bill Reed, Joel Ann Todd and Nadav Malin, *Expanding Our Approach to Sustainable Design – An Invitation*. (Brattleboro, VT: BuildingGreen Inc, 2005), 6.

been a strong push to look to nature for lessons, thus the interest in the notion of a living building.

1.4 Cradle-to-Cradle Design

Up to this point, the sustainability movement has largely relied on the notion of conservation and efficiency. While these notions are essential in the effort to change our mentality towards resource usage, they ultimately do not change the design model causing the problem, succeeding only in slowing down the degradation of our natural environment by never creating a real solution. This is what William McDonough and Michael Braungart dub the 'less-bad' approach that, "presents little more than the illusion of change. Relying on eco-efficiency to save the environment will in fact achieve the opposite; it will let industry finish off everything, quietly, persistently, and completely."[37] Their influential book *Cradle-To-Cradle* is all about this realization - that our current solutions are not presenting the real changes needed to help sustain and develop healthy human interaction within natural systems and that design professionals must continue to redefine how we think about sustainability. As they explain,

> Neither the health of natural systems, nor an awareness of their delicacy, complexity, and interconnectedness, have been part of the industrial design agenda. At its deepest foundation, the industrial infrastructure we have today is linear: it is focused on making a product and getting it to a customer quickly and cheaply without considering much else.[38]

They go on to explain that the solution to this linear style of production is essentially a design problem, getting away from an extraction-use-disposal model to a cyclical model where every component has a renewable source, multiple life-spans and ultimately

[37] William McDonaugh and Michael Braungart, *Cradle-to-Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), 62.
[38] William McDonaugh and Michael Braungart, *Cradle-to-Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), 26.

disposed of as a constructive piece of another cycle.[39] Similar to Fuller's realization, the notion of waste is gone. Every aspect of a product or building is designed to be part of a larger cycle of resource usage.

McDonaugh and Branguart develop this theory of a cyclical flow of resource use further by breaking down the variety of resources into two essential functions: biological and technical. Referring to these resources as nutrients, further suggesting their potential for contributing to a system, McDonaugh and Brangart analyze what types of materials exist and how they might best be passed from one useful life to another. In the first, biological, a material or product is designed to be completely and easily biodegradable, so that at the end of its useful life, it can be returned to the earth as a useful contribution to compost and soil regeneration, as a positive contribution to natural systems.[40] In the second, the authors recognize the existence and necessity of materials and products that are not easily biodegradable, or potentially toxic. For these materials, dubbed as technical nutrients, there would exist a closed industrial loop, where every non-biodegradable material is designed to return as a useful recycled material to replace the need for newly produced technical materials.[41] The different types of materials would be separated in every design, for ease of reuse, and eliminating waste.[42] They are identifying a new way to think about design from the bottom up, not focused only on the individual item being made, but also considering its past and future usases. It is a complete overhaul of the way we understand resource usage for production. By redefining the entire production system approach, they have given us a broad understanding of how a system of true sustainability would work.

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[39] William McDonaugh and Michael Braungart, *Cradle-to-Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), 104.
[40] William McDonaugh and Michael Braungart, *Cradle-to-Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), 105.
[41] William McDonaugh and Michael Braungart, *Cradle-to-Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), 110.
[42] William McDonaugh and Michael Braungart, *Cradle-to-Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), 114.

1.5 Regenerative Design

Architects such as Bill Reed of Integrative Design Collaborative have taken this realization one step further to begin to define a new ideal for sustainable design, where the human environment is not just sustainable, but acts as a positive contributor to natural ecosystems, living as a participant in a co-evolving system that is continually enriching, rather than degrading natural ecosystems.[43] He argues that reaching a point of sustainability, where we are simply not doing harm, is not a sufficient end goal. He seeks to create what he terms 'regenerative' systems, where human habitations within ecosystems continually grow and enrich the varieties of living elements and the complexity of beneficial relationships. It looks beyond the neutral standpoint of sustainability, what he refers to as being '100% less bad', to the potential for continual improvement. In Figure 1, Bill Reed outlines a Trajectory of Environmentally Responsible Design, visually showing the relationship of current construction practices versus regenerative design, illustrating the need for growth away from a degenerative relationship with nature to a restorative one. Only by striving to work within natural systems, in a relationship of enriching beneficial interactions, will humans be able to maintain and encourage the environments that support us.

[43] Bill Reed, *A Living System Approach to Design* (AIA National Convention, Theme Keynote Address, May 2007), 11.

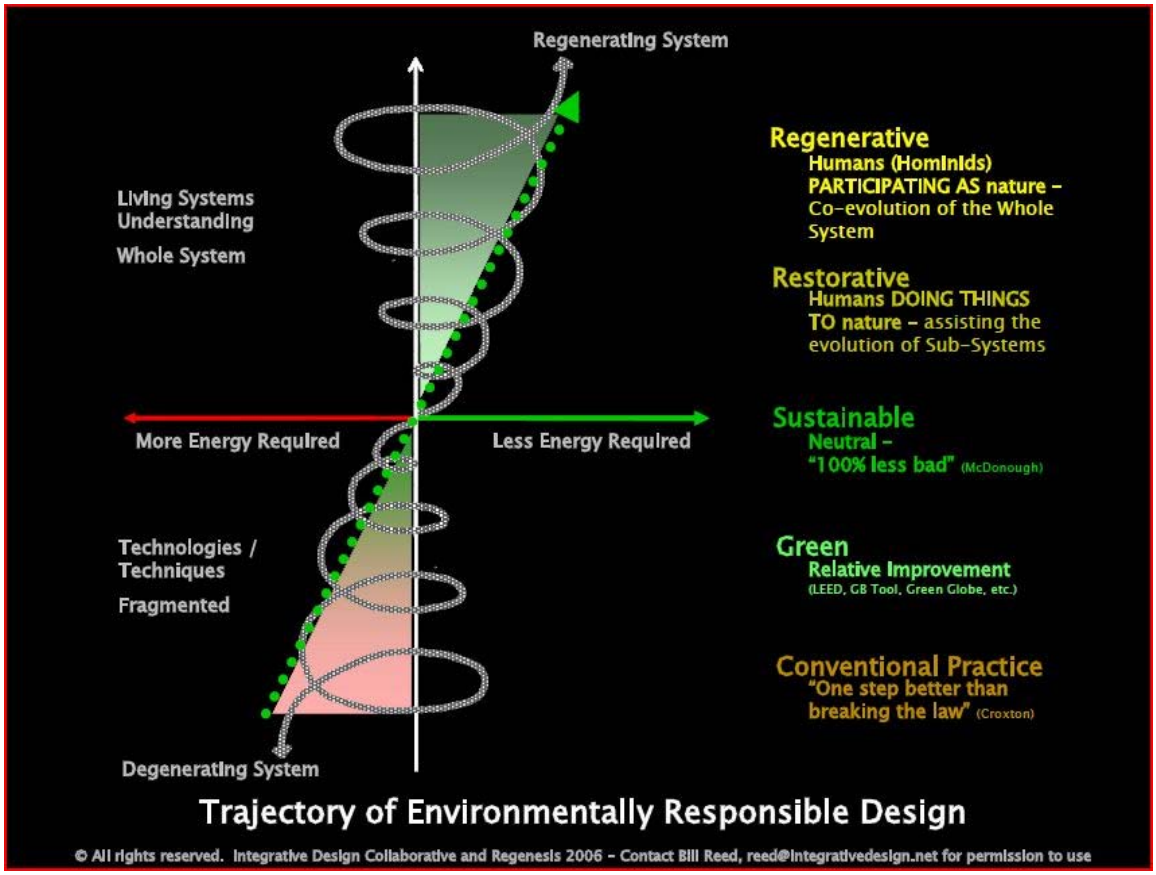

Figure 1 : Regenerative Design - Progression of Sustainable Design

Source: Bill Reed, A Living System Approach to Design (AIA National Convention, Theme Keynote Address, May 2007).

1.6 Biomimicry

Moving beyond the theories of resource management and environmental ethics, ecological understanding has also been used as a design strategy for finding specific technological and mechanistic strategies for solving human needs. Perhaps the most thoroughly discussed in modern architecture circles is the notion of Biomimicry, or the imitation of nature to create designs for human functional requirements. The author of Biomimicry, Janine Benyus, focuses on utilitarian lessons that can be learned from examples within nature, with a simultaneous slant towards a humble and appreciative attitude towards the environment. In her own words, Biomimicry is:

> Nature as model: Biomimicry is a new science that studies nature's models and then imitates or takes inspiration from these designs and processes to solve human problems, e.g., a solar cell inspired by a leaf
>
> Nature as measure: Biomimicry uses an ecological standard to judge the 'rightness' of our innovations. After 3.8 billion years of evolution, nature has learned: What works. What is appropriate. What lasts.
>
> Nature as mentor: Biomimicry is new way of viewing and valuing nature. It introduces an era based not on what we can extract from the natural world, but on what we can *learn* from it.[44]

Biomimicry is then a strategy based methodology for design, using ecological principles towards practical solutions to human ends. At its best, the theory lends itself to a sensitive and integrated union of the human and natural environments, through an observational and engaged understanding of the natural environment, which can lead towards practical innovation that is good for both humans and the environment.

Conversely, Biomimicry has also lent itself to a more shallow imitation of form alone, without the complexity of ecological understanding. What is interesting about the practice of Biomimicry is that even as solutions may be gained from natural models, the human created versions of these solutions may potentially have little to no connection with the natural environment. Biomimetic design is frequently made with entirely digital or synthetic means, staying wholly in the realm of the man-made. It has been adopted by some as simply a way to derive static form or as a solution to one particular strategy, not necessarily taking into account the complexity of its origins in the natural world nor the complexity of the locality within which it will exist. Natural ecologies are inherently complex, where the integrated whole is more than simply a collection of individual parts. It is about interactions, relationships, and dynamic flows of energy and resources. Biomimicry, which is frequently used as a reductionist design strategy that looks to nature for individual solutions to design challenges, progresses the goal of sustainability only when understood within this larger ecological framework.

[44] Janine M. Benyus, *Biomimicry: Innovation Inspired by Nature*. (New York: Harper Collins, 1997), vii.

1.7 Ken Yeang

The practical application of a whole systems approach to functional ecological design has been well documented by Ken Yeang. In his book 'Ecological Design', he lays out a clear manual with instructions for how to design "the biointegration of artificial-systems to natural-systems."[45] The basis for his design methodology is the thorough cooperation between human and natural environments. "Simple stated, ecological design or ecodesign is the use of ecological design principles and strategies to design our built environment and our ways of life so that they integrate benignly and seamlessly with the natural environment that includes the biosphere."[46] He achieves this seamless integration through rigorous study of each potential building site, first through an evaluation of the ecological history of the site, then through an inventory of the existing ecological baseline and context, moving onto an analysis of best design solutions for that particular site, and ultimately creating models of the infrastructure and systems to test the success of the 'biointegration'.[47] Yeang's work includes an intense level of scientific data that aid in the design process, so that the ultimate design may maximize the beneficial potential between human and natural environment.

Summary

What these architects are beginning to articulate in their living systems approach, is the need for design mentality to shift away from humans as separate from nature, which attempts to minimize contact with natural elements. Buildings that are made from imported materials and imported design strategies, with little to no relation

[45] Ken Yeang. *Ecodesign: A Manual for Ecological Design*. (Great Britian: John Wiley & Sons, 2006), 22.
[46] Ken Yeang. *Ecodesign: A Manual for Ecological Design*. (Great Britian: John Wiley & Sons, 2006), 22.
[47] Ken Yeang. *Ecodesign: A Manual for Ecological Design*. (Great Britian: John Wiley & Sons, 2006), 129.

to the environment around them, not only increase the embodied energy of the entire structure, but also demand more energy to maintain, as they are always battling to withstand the local condition. The sustainability movement can instead create more significant progress if the built environment is designed to exist within a positively participatory relationship within local ecosystems, wherein the human environment can function towards human needs while simultaneously enriching its environment. From this perspective, a 'living building' connotes one that acts as a biological entity feeding and being fed by a local community ecology. By listening to the site and utilizing natural systems through the employment of passive design strategies, sourcing locally available materials and systems that interact with the local ecology, the building can be an active contributing component within the environment, instead of existing in opposition to it. In this respect, the building becomes living, as a vibrant element of a larger system.

What, then, are the steps towards achieving this goal? There have been attempts to create design guidelines for the sustainability movement, with the development of third party certifications, first with LEED and more recently with the Living Building Challenge. The move from one system to another may represent the changing focus of sustainable design. The Living Building Challenge is the up and coming standard for sustainable design and differs from LEED by taking an ends over means approach. While LEED works on a point-based system, where certification is automatically given when a sufficient number of point worthy items are designed into a building, the Living Building Challenge is evidence-based, requiring a certain level of performance, so that only those buildings that prove to function as designed receive certification. Recently LEED has also begun to include certifications for buildings that prove to work as well as designed, further suggesting that fully integrated, evidence-based design is the future of sustainable design. If this is then the new standard for sustainable design, what is the Living Building Challenge requiring, and what does that communicate about the architecture that will come out of this environmental era of design? Architect Jason McLennan very succinctly defines the principles of the 'Living Building Challenge':

SEVEN SIMPLE PRINCIPLES OF LIVING BUILDINGS:

1. Harvest all their own water and energy needs on site.
2. Be adapted specifically to site and climate and evolve as conditions change.
3. Operate pollution-free and generate no wastes that aren't useful for some other process in the building or immediate environment.
4. Promote the health and well-being of all inhabitants, as a healthy ecosystem does.
5. Be comprised of integrated systems that maximize efficiency and comfort.
6. Improve the health and diversity of the local ecosystem rather than degrade it.
7. Be beautiful and inspire us to dream[48]

What becomes evident from this list is the classic design challenge for architecture – form and function. Numbers one through six focus on the functions of a living building, leaving only principle seven to form. What this indicates is how function oriented the sustainability movement has been thus far. It becomes obvious that the next push for the furtherance of an ecological design, is to consider what aesthetic these ideals will adopt. If this is a new era for architecture, there must be a visual language that carries it. What aspect of sustainable design will fulfill principle seven – be beautiful and inspire us to dream?

[48] Jason Frederick McLennan, www.care2.com/greenliving/living-buildings.html. (accessed August 20, 2011).

CHAPTER 2: AESTHETICS OF NATURAL SYSTEMS

The ecological principles discussed in Chapter One have been abundantly researched for their functional contribution to design, but have not necessarily been as well developed for the space-making qualities that are so vital in architectural design; what is it that makes a 'space', in terms of emotions, psychological well-being, human efficiency, inspiration and intrigue. The essential piece of human habitations is not simply about how our systems function – but entail the more soulful acts of dwelling. This is an apparent lack in much of the developing environmentalist mindset. There is much discussion of how we have negatively affected the environment, why we should change, and even practical steps for how we can change. What that leaves is the question: What will make us want to change? This is the next job for designers – to create spaces that not only mechanically function in a sustainable way, but fulfill the intangible qualities that humans desire. Architecture is a discipline that combines form and function to create inspiring spaces. If shelter was simply about function, it would never touch on the sense of delight that allows the human spirit to soar. Conversely, if architecture is solely about form, than the inability to exist practically in it would render it useless after the initial moment of enchantment. Truly inspired architecture is the perfect marriage of form and function – this is what sustainable design theory is missing. Architecture must dig deeper, in order to re-examine the fundamental basics behind the role of the built environment to the natural environment in order to create an *exciting* evolution of architecture, one that more beautifully integrates natural systems in a positively participatory relationship with the local ecology.

The theory of an ecologically based architecture is still vital to this discussion. The notion of a 'living building' is not simply looking at the life of the environment, but also at the living human within the environment. Human concerns are what we typically think that architecture deals with – the spatial needs and desires of human habitation.

This includes aesthetics, efficiency, physical and emotional health and comfort, and especially the most basic needs such as food and shelter. It concerns the inherent connectivity of man to nature and how our separatist attitude towards nature has negatively affected our collective well-being as well as the environment.

When looking at the idea of a living building from this perspective, the human component begins to articulate the ways in which human necessities exist as a living component of our built environment. The needs of humans in this context are just as important as the other components within the balance of relationships comprising an ecosystem – not more or less. To create a living building, a structure for the comfort and well being of modern man within nature, means to find how humans are physically and psychologically connected to their natural surroundings and develop a cohesive interrelationship of natural and human elements. It is active beneficial participation between man and ecology for occupant health as well as mechanical function.

In order to develop a more thoughtful integration of natural systems into the built environment, it is essential to analyze the ways in which humans relate to their environment and determine what creates thoughtful and emotional reactions that humans associate with. Architecture is not merely a shell for activity, but an embodiment of biological need, cultural identity and signifier of meaning. Humans associate with architecture through sensual perception of its elements, relying on sight, smell, sound, taste, touch and radiant energy to interpret their place in the world. The study of these corporeal aspects is really the study of aesthetics – how one is stimulated by sensory perception and ultimately the effects of that stimulation.

2.1 Importance of Aesthetics

In many senses, the discussion of aesthetics is a sensitive one. Frequently, in modern societal thinking, aesthetics is deemed to be a luxury, in the sense that it does not retain the same essence of necessity as function. It is considered desirable, but not

essential. There has even become a certain disdain for aesthetics in modernity, with a decided preference for subjects that are seen as more utilitarian and therefore more substantial.[49] This is in direct relation to the inherent difficulty in defining aesthetic value. Aesthetic appreciation involves such a variety of components that it is impossible to qualify or universalize an aesthetic 'truth'. It combines an amalgamation of individuality, time, culture, environment, and duality between conscious and sub-conscious reactions – all contributing to its varying nature. This is why it is difficult to define aesthetics, let alone create design guidelines for application. It is also its relative nature that has given it the stigma of being superfluous. How can one place primacy on something that can't even be quantified with any accuracy? In current culture, driven by quantifiable certainties – facts, numbers, and scientific reasoning – the unreliability of aesthetic standards does not carry the same amount of weight. Yet aesthetics has maintained a place of primacy throughout time, despite the inability to definitively understand or quantify aesthetic certainties. The subject has been toiled over by many of the greatest philosophical thinkers, has driven the creation of some of the longest lasting and most valued human artifacts, and has continually influenced economic and sociocultural development. Aesthetics are intimately tied to the way in which mankind feels about the environment, how to decide what to buy, how to present oneself, and how to judge everything in the world. In recent times, this has also led to a realization that aesthetics also determine much of one's emotional, psychological and physical well-being, suggesting a much more practical rationale for the significance of aesthetics. Despite its relative nature, aesthetics influence such an extreme spectrum of the human experience, suggesting that it is much more of necessity than is currently allowed.

Aesthetics are rooted in the basic way in which humans access the world – through the perceptions gained from the five senses. In fact, the word aesthetics is derived from the Greek word *aisthanomai*, meaning "perception by the means of the

[49] Nick Zangwill. "Aesthetic Judgment", *The Stanford Encyclopedia of Philosophy* (Fall 2010 Edition), Edward N. Zalta (ed.), http://plato.stanford.edu/archives/fall2010/entries/aesthetic-judgment/ (accessed November 28, 2011).

senses."[50] Every sensory intake taps into a lifetime of memories, recalling instantly the various associated actions and reactions that help to orient oneself in the world, make decisions, and trigger an emotional state of being. These sensory intakes are then processed by the varying brain functions driven by individual experience, cultural expectation, educational training, and timing; all of which categorize things into positives and negatives. Aesthetics, as in the constant sensory perception that guides human existence, is an inherent aspect of every experience, continually influencing well-being - psychologically, physically and emotionally. It becomes obvious that the study and implementation of aesthetics is more than just a frivolous pursuit, but an essential component to a fulfilling and responsive architecture.

The pursuit for understanding aesthetics is then the pursuit of understanding how humans relate to the world and can be broken into two paths of analysis: emotional and intellectual, or subconscious and conscious. As things are perceived, they are processed both instinctually, relying on basic emotional intuition, as well as cognitively, relying on conscious reasoning. This distinction, between the sensory and cognitive aspects of aesthetic appreciation has been a source of much debate. One dominant strain of aesthetic theory is the *rationalist theory*, which considers the judgment of beauty to be a process of reason, in which one appreciates beauty by inferring principles and concepts.[51] Alternatively, there is the *immediacy theory*, claiming that judgments of beauty are derived from direct sensory perceptions, without reference to concept or principle, where one does not come to the conclusion that something is beautiful with reason, but rather through "taste".[52] In this interpretation, having 'taste' means to be able to instinctively judge aesthetics. The literal reference to one of the main human senses linguistically reminds one of the origins of these direct,

[50] Malcolm Budd. "Aesthetics" E. Craig (ed.), *Routledge Encyclopedia of Philosophy*. London:Routledge. http://www.rep.routledge.com/article/M046 (accessed November 28, 2011).
[51] Nick Zangwill. "Aesthetic Judgment", *The Stanford Encyclopedia of Philosophy* (Fall 2010 Edition), Edward N. Zalta (ed.), http://plato.stanford.edu/archives/fall2010/entries/aesthetic-judgment/ (accessed November 28, 2011).
[52] Nick Zangwill. "Aesthetic Judgment", *The Stanford Encyclopedia of Philosophy* (Fall 2010 Edition), Edward N. Zalta (ed.), http://plato.stanford.edu/archives/fall2010/entries/aesthetic-judgment/ (accessed November 28, 2011).

intuitive interpretations of the world. Throughout this dual track of inquiry, it has become increasingly obvious that these methods for making aesthetic judgments are in fact linked and interdependent. For architecture, this becomes an especially important duality, because unlike some arts, architecture is both a full sensory experience as well as a signifier of meaning. Because one appreciates architecture from without and from within, in a journey through time and space, it relies on all five senses to fully understand, while it must simultaneously communicate purpose to its inhabitant. It can be thought of as the combination of aesthetic value and aesthetic experience,[53] where rationally one decides the worth of the significance portrayed, while the direct sensory judgments create an emotional connection.

According to environmental psychologist David Canter, the two processes are distinct yet inextricably linked. He points out the difference between preferences and evaluations, preferences referring to emotional sensations that are instinctively generated, versus evaluations, which speak to a deeper intellectual consideration that challenges, enlightens or stimulates cognitive awakening.[54] Canter points out that this is the essential difference between responding to needs versus desire. Humans are instinctively attracted towards things that provide for essential needs, identifying those features that make life more comfortable. Yet simply fulfilling animal needs is not sufficiently satisfying; humans desire more stimulation than basic perfunctory requirements provide. As early as the Gospel according to Matthew, it was observed that mankind cannot live on bread alone.[55] There must be some sort of significance or motivation arrived at through mental reasoning that refers to a valued meaning. Architecture must then reconcile both requirements, creating an emotionally satisfying experience that responds to user needs as well as intriguing mental stimulation.

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[53] Nick Zangwill. "Aesthetic Judgment", *The Stanford Encyclopedia of Philosophy* (Fall 2010 Edition), Edward N. Zalta (ed.), http://plato.stanford.edu/archives/fall2010/entries/aesthetic-judgment/ (accessed November 28, 2011).

[54] David Canter. 'Health and Beauty: Enclosure and Structure', in *Aesthetics, Well-being and Health* edited by Brigit Cold. (England: Aldershot Publishing, 2001), 52.

[55] David Canter. 'Health and Beauty: Enclosure and Structure', in *Aesthetics, Well-being and Health* edited by Brigit Cold. (England: Aldershot Publishing, 2001), 51.

For a budding environmentalist design language, these two routes of investigation into man's aesthetic judgment-making must be analyzed to ascertain the root of man's relationship to nature and how that affects architectural expression. Mankind has both a literal, physical and emotional relationship to nature, as well as an intellectual understanding of the relationship of human to environment. Both will be analyzed to determine their pertinence to the integration of natural elements with the built environment.

2.2 Aesthetics : Biological Determination

The emotional component of aesthetic appeal through direct sensory perception has alternatively been explained as not simply referencing immediate user needs and comfort, but as an actual physiological reaction. From this vantage point, the essential components of aesthetic appreciation can be seen as tied to a genetically learned behavior originating from the identification of the basic survival needs of mankind's ancestors; that our aesthetics are to a certain extent biologically engineered. From this evolutionary standpoint, those humans "who developed an ability to identify more suitable environments for habitation would be more likely to pass on these genes, hence our current aesthetic preference for these elements."[56] This idea derives from the work of Edward O. Wilson. Wilson claims that there exists an essential aesthetic that mankind has a predestined attraction towards because of the evolution of our species. Wilson argues that humans are intuitively creating certain aesthetics that, "are responding to a deep genetic memory of mankind's optimal environment,"[57] specifically the first environment that allowed for the evolutionary progression of homo sapiens – the savanna. This originating environment had advantages key to human survival: an

[56] Geg Michalec and Jenny Hershberger. "The Beauty of Survival: Sociobiological Perspective on Natural Aesthetics". Research Topic. NSII Final. May 6, 1998. http://jrscience.wcp.muohio.edu/Research/HNatureProposalsArticles/TheBeautyofSurvival.Socio.html (accessed August 21, 2011).
[57] Edward Wilson, *Biophilia*, (Cambridge: Harvard University Press, 1984), 113.

abundance of plant and animal food, open landscapes that allowed for surveillance, topographical features such as cliffs that allowed for strategic positioning advantage, clumps of trees for retreats, and waterways such as lakes and rivers to provide for drinking.[58] He argues that because of this original connection between landscape and survival, we are now predestined to prefer, "open tree-studded land on prominences overlooking water."[59] There is certainly modern visual evidence of this hypothesis. If we look at most modern parks, they contain open areas, with some trees and a water feature. Even in the ubiquitous suburban lawn, there is an open grass area with islands of trees and shrubs and an occasional pool or fish pond. Whether Wilson's savanna theory holds to be truth or not, he is articulating an interesting point – that there are fundamentals that continue to retain their aesthetic appeal regardless of time or place and that perhaps much of the emotional attraction to aesthetics is biologically determined.

For the architect, what is perhaps more pertinent within Wilson's work is his more generalized biophilia hypothesis, or "the Innately emotional affiliation of human beings to other living organisms…"[60] With the savanna theory, Wilson attempted to isolate individual elements that were advantageous to the survival of earlier humans, but with the biophilia hypothesis lies the broader and more accessible idea that humans are instinctively attracted to natural elements. While the re-creation of the exact conditions of the savanna landscape would be impractical and inappropriate in the modern context, the lingering identification with these natural elements continues to survive within the human subconscious. What Ed Wilson was able to do with his biophilia hypothesis was to bring to the conscious brain something that is intuitively felt, but increasingly ignored. "The pleasure we feel from being in beautiful places is part of the neural makeup of the human brain. Our sense of beauty evolved because it led our ancestors to seek out places that aided their survival and well being . . . The more our

[58] Edward Wilson, *Biophilia*, (Cambridge: Harvard University Press, 1984), 110.
[59] Edward Wilson, *Biophilia*, (Cambridge: Harvard University Press, 1984), 110.
[60] Edward O Wilson and Stephen Kellert, eds., *The Biophilia Hypothesis*, (Washington, DC: Island Press, 1993), 31.

buildings can tap into our ancient sense of beauty, the more likely they will support us psychologically and emotionally, as well as functionally."[61] The significance of this theory is that the aesthetics of natural elements is so ingrained within the human psyche that it is not only preferable, but has a dramatic effect on well-being. The biophilia hypothesis identifies the essential connection of nature and human health, where the evolutionarily developed instincts within aesthetic judgment lead humans to desire that which encourages a healthy existence.

This has in turn created an entire host of research attempting to create scientific substantiation for the emotional benefits that natural systems have on humans. Yet this connection is challenging to quantify. Some evidence is more readily obvious, such as the improved indoor air quality due to the presence of vegetation, or the basic economic reality that spaces with views of natural scenery are more desirable. These sorts of numbers are available, in terms of how much CO_2 is converted by vegetation, or how much real estate value is affected by visual access to scenery, but there is not as much established research on how these numbers correlate aesthetics and well-being. The biophilia hypothesis provides a theoretical basis for this correlation, but individual studies have begun to try and develop the correlation further.

In the now influential report by the Rocky Mountain Institute, *Greening the Building and the Bottom Line* - a study of spaces that were renovated for energy efficiency by incorporating more passive and natural systems - it was shown that the connection to natural elements had the added benefit of increasing occupant pleasure and effectiveness. Workers were more productive, came to work more regularly, and continued with the same company for longer, when exposed to natural elements.[62] This was also found in other examples. In Reno, Nevada, a post office became the most productive post office in a region stretching from Colorado to Hawai`i after being

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[61] Judith Heerwagen and Betty Hase, *Building Biophilia: Connecting People to Nature in Building Design*, http://www.treebenefits.terrasummit.com/Documents/Health/Building%20Biophilia%20--copywrited.pdf (accessed August 3, 2011)

[62] Joseph J. Romm and William D. Browning. *Greening the Building and the Bottom Line: Increasing Productivity through Energy-Efficient Design*. (Colorado: Rocky Mountain Institute, 1994), 1.

retrofitted to include more natural lighting.[63] A warehouse in Costa Verde, California was retrofitted to a primarily day lit space and saw a 47% decrease in worker absenteeism.[64] The increased connection to natural elements, in these cases natural lighting, dramatically affected the productivity and health of the workers, strongly suggesting an increase in overall well-being. It may be easy to question whether the results were indeed connected to the increase in natural lighting, but another example in a Wal-Mart in Lawrence, Kansas seems to create a more compelling story. The Wal-Mart in Lawrence was a prototype of an environmentally friendly design for Wal-Mart, in which skylights were installed as part of an initiative to bring in more natural lighting as a way to reduce energy demands. Due to financial restraints, the store only installed the skylights in half of the store. What they found was that the half of the store with natural lighting had significantly higher sales per square foot, and workers were happier to work in those sections.[65] The shoppers were happier to purchase and the employees happier to work in a section of the store that's only difference was the presence of natural lighting. These productivity studies were intended to showcase the economic benefits of introducing energy efficiency strategies into the built environment, in this case natural lighting, but they also illuminate the way in which this natural element helped to improve the quality of the built space and how that directly affected the well-being of the building inhabitants.

Other natural elements similarly proved to increase the psychological well-being of inhabitants. A study was led at a public housing complex that consisted of 28 identical high rise buildings, some surrounded by trees and some surrounded by barren stretches of land. The study tracked the first floor residents from those buildings with surrounding trees compared to those without. What they discovered was that the "nearby trees are associated with higher levels of attention and self-discipline, less

[63] *Constructing the Biophilic Community*. An essay for the proceeding of Constructing Green, Ross School of Business, University of Michigan, Ann Arbor, May 2010, 2.
[64] *Constructing the Biophilic Community*. An essay for the proceeding of Constructing Green, Ross School of Business, University of Michigan, Ann Arbor, May 2010, 2.
[65] *Constructing the Biophilic Community*. An essay for the proceeding of Constructing Green, Ross School of Business, University of Michigan, Ann Arbor, May 2010, 3.

violence and aggressive behavior, lower crime rates, and better interpersonal relations."[66] The better behavior showcased in this study again strongly suggests that the presence of a natural aesthetic correlated to a greater sense of well-being.

Perhaps the most compelling evidence of this correlation is showcased in studies within the field of environmental epidemiology, or the study of the distribution and determination of disease in human populations in relationship to environment.[67] A significant study led by Robert Ulrich traced the recovery time of surgery patients in relation to their access to natural elements. In the study, some patients had a view of trees and shrubs while other patients had a view of a brick wall. What he found was that "the patients with the view to nature had a shorter average recovery period, took fewer painkillers, and had fewer nursing calls."[68] In another study tracking prisoner health, architect Ernst Moore tracked prisoners that had a view of farmland and trees from their cells compared to prisoners with only a view of the prison courtyard. What he found was that the prisoners with no view of nature had 24% higher frequency of sick calls visits.[69] While the behavioral studies related to productivity and crime rates suggest the connection of natural aesthetics to overall well-being, these epidemiology studies create a more direct correlation of health and access to nature. One may argue that studies like these are somewhat non-determinant, because it is inherently challenging to control the many variables within the study situation, but they do

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[66] Howard Frumkin. "Nature Contact and Human Health: Building the Evidence Base" in *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*. Edited by Stephen R. Kellert, Judith H. Heerwagen and Martin L. Mador. (Hoboken, New Jersey, John Wiley & Sons, 2008), 111.

[67] Howard Frumkin. "Nature Contact and Human Health: Building the Evidence Base" in *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*. Edited by Stephen R. Kellert, Judith H. Heerwagen and Martin L. Mador. (Hoboken, New Jersey, John Wiley & Sons, 2008), 109-111.

[68] Roger Ulrich, "View Through a Window May Influence Recovery from Surgery." *Science* 224:420–421, 1984, Found in *Constructing the Biophilic Community*. An essay for the proceeding of Constructing Green, Ross School of Business, University of Michigan, Ann Arbor, May 2010, 3.

[69] Ernst O. Moore. "A Prison Environment's Effect on Health Care Service Demands." Journal of Environmental Systems. 1:17-34. Found in "Nature Contact and Human Health: Building the Evidence Base" by Howard Frumkin, in *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*. Edited by Stephen R. Kellert, Judith H. Heerwagen and Martin L. Mador. (Hoboken, New Jersey, John Wiley & Sons, 2008), 111.

nonetheless create a compelling start to the creation of a base of evidence explaining the biophilia hypothesis.

What all of these scientific studies are beginning to outline is an intuitive human reality – nature is appealing. The aesthetic connection to nature is intimately tied to human existence, and therefore has a real affect on the psychological, emotionally, and physical well-being of humanity. The aesthetic connection to these natural elements, gained through the direct sensory perceptions, trigger an innate biological and neurological response in humans, one that is deserving of more legitimization in design.

2.3 Aesthetics : Intellectual Determination

The truth about aesthetics, however, is that humans do not always value that which is best for physical or mental health and happiness. Aesthetic desire is frequently driven by other motivators – culture, socioeconomic standing, personal upbringing, time period, etc. The dichotomy of aesthetics based on comfort versus desire is intimately related to the intellectual component of aesthetics – an idea based understanding of attraction where cognitive reasoning creates a deeper level of stimulation than the basic emotional reaction. For architecture, this has meant that many of the most spectacular architectural masterpieces frequently originated not from pure necessity, but from the desire to reach an ideological ideal.

Modern intellectually-based aesthetics theory inherited much of its thinking from the Greeks, who sought to find purity in form. The work that has survived as the origin of much of modern philosophy on aesthetics is from Plato, who developed an understanding of the difference between an essential ideal of beauty and the perceived reality of beauty – the dichotomy between sensory intakes and cerebral processes. He explained the difference between the phenomenon of beauty, which is part of the empirical world and perceived through the senses, and the form of beauty, which is the ideal form existing only in the metaphysical realm. Plato claimed that nothing in the

existing world reached the perfection of the ideal form; physical objects were all only a mere imitation of perfection.[70] The intellect, for Plato, was the only way to access true aesthetic appreciation.

This thinking created the desire to strive for aesthetic perfection using cognitive reasoning. In the architectural realm, this was achieved through the use of geometry and proportions - mathematics representing an immutable truth, a way to translate the ideal form existing in the metaphysical realm. In this way, ancient Grecian architectural aesthetics were driven by an intellectual understanding. The architecture was a monument to the ideals of the culture in its time.

This underlying truth is an inherent reality for all architecture. However grand or bland, every piece of architecture is a standing legacy of the cognitive processes of the creator. Architectural aesthetics represent the ideological identity of a culture: the values, aspirations, achievements and definitions of beauty.[71] Articulating this intellectual component of aesthetics is then an interpretation of the driving ideologies of a culture in its time and place. This aspect of aesthetics is learned. It is arrived at continuously as a culture and people progressively redefine themselves, based partly on their traditions and partly on their future.

So the question then becomes, how does this continual growth of aesthetic evaluation develop? Ideals are revealed and expressed by those in society who have honed their intellectual capacity for interpreting intellectual aesthetics separately from an emotional response. Aesthetics researcher Brigit Cold credits artists as being, "'discoverers' of beauty,"[72] showing how artistic expression helps bring a certain intellectual understanding that can redefine the notion of beauty within a culture. This certainly explains the great difference between mass appeal and the opinions of experts within a field. If the perception of aesthetics is both emotional and intellectual, than it

[70] Sir William David Ross. *Plato's Theory of Ideas*. (Greenwood Publishing Group, 1976).
[71] David Canter. 'Health and Beauty: Enclosure and Structure', in *Aesthetics, Well-being and Health* edited by Brigit Cold. (England: Aldershot Publishing, 2001), 55.
[72] Brigit Cold, ed. *Aesthetics Well-Being and Health*. (England: Aldershot Publishing, 2001), 20.

stands to reason that every person will use a different proportion of emotion to intellect when reacting to aesthetics. Those professionals in aesthetically related fields – designers, artists, craftsmen - continually strive to express the intellectual aesthetic most closely representing the current cultural ideal at any given time. This combined momentum helps to define the future path for aesthetic evaluation. It also places an incredible responsibility in the hands of those that help define a culture's desired aesthetic.

This is certainly true for architecture. Architects are expected to be leaders in innovation and formal articulation. When leading architects in the field begin to articulate design principles, then the collective mindset of society begins to see them as progressive, and more importantly, attractive. The collective social mindset determines what becomes prevalent in society. This places a great amount of responsibility on the architect to help define the intellectually valued aesthetic. In relation to the contemporary environmental movement, architects possess the ability to help shape a desired aesthetic that also responds to the ideals of sustainability.

2.4 Origin of Current Architectural Aesthetics

The current architectural landscape is dominated by the legacy of modernism. Since the industrial revolution, there has been a continual push for an architecture of increased efficiency and simplicity, showcasing new human technological and engineering feats. Modern architecture has been indebted to, and in the shadow of, the international style and the idea of functionalism. It has been about an admiration of the machine[73] – a notion that strips down design to its essential components, believing that an articulation of function creates pure and ideal forms. This idea of "form follows

[73] Le Corbusier. *Towards a New Architecture*. (Lexington, KY: BN Publishing, 2008), 95.

function" led to a desire for simplicity, through the elimination of unnecessary detail, meaning that the true structure and mechanics of the building should be the aesthetic.[74]

Even though modernism has been the pervasive design aesthetic for a long period of time, there is still doubt as to whether it is successful from an aesthetic standpoint. Modern architecture has many marvelous examples within the public arena, but is not as prevalent in the private, which suggests that it does not have the aesthetic that most people want where they need to feel the most comfortable – their home. There is the common critique that modernism is cold and inaccessible, which may work in structures that serve for impersonal functions, but do not satisfy the need to feel an emotional connection required in more personal spaces. In its complete denial of anything deemed extra, modernism strips away not just ornamentation and frivolity, but also the detailed touches that give space personality and life. This can perhaps be attributed to the origins and ideals that drove to the development of modernism. It is certainly an aesthetic that originated from an ideal, a manifesto on the idea of beauty related to technology, engineering and a utopian outlook.[75] All of these values are accessing the intellectual side of humanity, seeking to find perfection in human ingenuity and logic. In this way, modernism is a learned aesthetic, one that is most appreciated when understood on an intellectual level. This is what it has ended up attracting, those that have a learned appreciation for this ideal.

Modern architecture can be seen as embodying the values of the society from which it originated: the progress of mankind through technology, industrialization, mass-production, speed and efficiency – newer, bigger, better. It is now time to ask if what was created with modernism still reflects societal values. Certainly, pure modernistic forms have an air of sophistication as part of a learned aesthetic, but are

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[74] Louis H. Sullivan. "The Tall Office Building Artistically Considered" *Lippincott's Magazine* (March 1896). http://ocw.mit.edu/courses/architecture/4-205-analysis-of-contemporary-architecture-fall-2009/readings/MIT4_205F09_Sullivan.pdf (accessed December 1, 2011).

[75] Richard Rinehart. "Utopia Now and Then: Retroacting Modernism" Richard Rinehart : Papers. http://www.coyoteyip.com/rinehart/papers_files/utopia_now_and_then-rinehart.pdf (accessed December 1, 2011).

they spaces that truly make people happy? If the ideal of the modernist manifesto was to create a perfect machine for living, has that been achieved? Modernism has lasted as the leading cultural aesthetic for quite some time now, and just as any attempt at reaching an ideal, it has failed in many ways.

In its search for simplicity and minimalism, a pure articulation of form driven by function, modernism is anything but simple or minimalistic. From an environmental standpoint, modernist structures are frequently the most complex. Interestingly, modernism has also developed into the opposite of its idealogical intent; it has become primarily a visual aesthetic, regardless of function. Highly modern structures, because they exist as an object in the landscape, are always fighting to resist the natural conditions of place in order to maintain an idealized aesthetic, typically necessitating more resources to build, more energy to run and maintain, and more money to access. Mankind now consistently exists within environments that are either heated or cooled, with water coming from anonymous sources, and sewage systems that take waste to unknown locations. This is not a pure articulation of form following function, but rather form hiding unnecessarily complex function. David Canter dismisses the ideal of form follows function as a, "Short lived idea in architecture. Even at its height it was more a visual style than a mechanical response to the use of buildings."[76] Yet, this aesthetic has persisted in our cultural mindset; an intellectual ideal that is falling short of its original intent.

The really devastating consequence of modern architecture, however, is not the original architects' principles, but rather the way in which these values have been interpreted on a wide-scale. The utopian ideal that designing for function will create a pure and desirable aesthetic has been translated, for the most part, as bland, utilitarian structures devoid of any emotional access. They become shells that simply hold the objects for living. To a large extent this is because the majority of current construction is not done by architects, or anyone trained with the awareness of aesthetics. The cost-

[76] David Canter. 'Health and Beauty: Enclosure and Structure', in *Aesthetics, Well-being and Health* edited by Brigit Cold. (England: Aldershot Publishing, 2001), 53.

driven construction model, led by developers, engineers, and the like, has adopted the modernist aesthetic, unsuccessfully, simply because it is an affordable and efficient style of construction. In this model, aesthetics is simply deemed an accessory, something to be tacked on by interior designers and stylists once the business of building is complete.

This critique is not intended to demonize the modernist aesthetic, but rather to articulate the importance of a continual examination of what the aesthetics of the built environment are communicating. Every design aesthetic has the potential for catastrophic failure, or sublime realization. Architecture must question: if aesthetics are the way in which society articulates its values and attends to human needs, does the modernist aesthetic still portray the values of today and for the future? With this comprehension comes the inevitable examination of the burgeoning environmentalist movement. If this era is to be defined by the reconnection with nature, and a more sensitive integration of mankind within his ecological surroundings, then the aesthetics of this era will represent either the success or failure of that ideal. In many ways, it is an exciting opportunity for designers to help define a new period for aesthetic expression. If this is indeed the early years of a new visual language based on an environmentalist ideology, then we must examine how the aesthetics of this era are embodying ecologically based concepts.

Summary

The real way to create meaning, to give a location or building enough significance that it becomes a 'place', is to understand that architects are articulating both the emotional, subconscious needs of a society as well as the intellectual, conscious values and ideologies of its time and place. It is only when this inherent nature of aesthetics is understood as an integral aspect of every component of our built environment, that masterful spaces are created. Function does not necessarily appeal without form, and form does not have meaning without function. The same is true in

our journey towards sustainability. The functional systems that have been devised to catch and purify water, harness renewable energy, and successfully reconnect the built environment with nature, are in dire need of this analysis. What becomes evident when we look at both the environmental and human concerns for man's relationship with nature is that they are both revealing a similar truth - we are at a critical point where mankind needs to more closely relate to the environment for the health of both.

In the contemporary context, this involves interpreting a new aesthetic that embodies the values of environmentalism and beneficial cooperation between built environment and local ecology. What architects are able to do to help integrate natural systems into the built environment, is to help bring them to the level of defined and inspired formal articulation that will help them to be more widely accepted. It is the development of a desirable aesthetic that embodies ecological ideals, which will captivate cultural attention and create a significant impetus for the pervasive change needed for a sustainable future.

Chapter 3: Significance - Cultural Relationship to Nature

If the future of architecture is the pursuit of a more ecologically responsive integration of the natural and built environment, aesthetics are vital as the way in which these sustainability strategies are represented, both for the health of humanity and the health of the environment. As noted, aesthetics can drastically affect the success or failure of any given human pursuit. However, aesthetics solely created for aesthetics sake are fleeting. Architecture is an art form that relies on more than a transitory moment of awe. The built environment is a monument, a standing testament to the values and discernment of a culture in its time. Aesthetics that not only intrigue the senses but also translate a cultural identity are able to carry this message into future generations and cultural identities. It is these buildings, embodying the forms of cultural significance, as the current values arising out of a cultural heritage, which create lasting and beloved environments. With the advent of a new design language integrating natural elements within the built environment, historic and cultural connections to flora and fauna become especially meaningful. There is a broad range of cultural associations with the human engineered landscape, all laden with various significances. For the future of an environmental movement in architectural design, the analysis and consideration of these cultural connections to nature become particularly relevant.

3.1 To 'Garden' or to 'Landscape'

There are many ways in which mankind already associates meaning when thinking of a natural environment and its relationship to a human environment, derived from different social and cultural traditions. In the modern world, the relationship

between nature and the built environment is a highly complex and disjointed association. This relationship – man to nature – lies on a symbolic spectrum, with complete wild on one end and controlled sterility on the other. Man is happiest within the middle of this spectrum. The degree of wild to control varies greatly, and it is in these definitions of where the line of unabandoned nature and strict rigidity lies that varies from culture to culture and throughout time. An initial way to investigate this relationship is linguistically. Terms such as 'garden' and 'landscape' define how humans manipulate the natural environment. The way humans speak about the relationship with nature is evidence of the larger societal mentality towards the relationship. Gardens and designed landscapes are interesting because they are the expression of mediation between nature and man. They articulate cultural consciousness of environment through the style of design, choice of plants, and activities invested in the space.

'Garden', the most inclusive and frequently used word, can signify an enormous range of meaning. The most frequent meaning for garden is, "a plot of ground, usually near a house, where flowers, shrubs, vegetable, fruits, or herbs are cultivated."[77] This basic understanding of 'garden' is exterior to the built environment and necessitates both open air and little to no containment from the ground; primarily arranged for the cultivation of plants. In the second definition: "a piece of ground or other space, commonly with ornamental plants, trees, etc., used as a park or other public recreation area,"[78] the tone of the space has changed from utilitarian to leisure and is no longer restricted to either the exterior or to the ground plane. The reason that 'garden' can range so greatly is because it is a space that is intimately tied to specific cultural ideas, in which the garden space satisfies certain social functions, be they practical or aesthetic.[79]

[77] Random House Dictionary, s.v. "garden", www.dictionary.com (accessed October 5, 2011).
[78] Random House Dictionary, s.v. "garden", www.dictionary.com (accessed October 5, 2011).
[79] Clariss T. Kimber. "Gardens and Dwelling: People in Vernacular Gardens," *Geographical Review*. Vol. 94, No. 3, People, Places & Gardens (Jul., 2004), 267.

In order to embrace and understand the many roles of a garden space, author Clarissa Kimber organizes the many principles for garden creation into three main categories: Biological and Physical, Cultural and Social, and Landscape Design and Art History. (See Figure 2 for Kimber's complete chart) The categories articulate the many different manifestations of garden space in the human environment.[80] She explains, "in the first interaction the garden produces material goods, food, fiber and medicine. In the second, it is a setting within which certain social exchanges can be realized . . . In the third, it leads to a 'state of consciousness, or mental state' (aesthetic pleasure, delight,

BIOLOGICAL AND PHYSICAL: PLANTS AS BIOLOGICAL ENTITIES	CULTURAL AND SOCIAL: PLANTS AS CULTURE TRAITS	LANDSCAPE DESIGN AND ART HISTORY: PLANTS AS DESIGN ELEMENTS
Garden floristics and structure Native/non-native	Gardens and their species complexes as revealing ethnicity	Gardens as spaces to view and pass through
Gardens as agroecosystems Small farming systems Sustainable agriculture Poverty reduction	Gardens as household spaces Spaces for washing, cooking, and social activities	Gardens as high-style tradition Morphology by design Meaning of design
Gardens as substitutes for natural communities, as habitats for wild fauna and those passing through it	Gardens as sites of economic activities Contributions to home income Sites of cultural reproduction Reciprocity networks	Appropriate social behaviors in gardens
Gardens as places to conduct conservation-biology studies	Gardens as sites for political action Negotiated, contested space Political activity / citizenship	Temple gardens Ritual behaviors in gardens
Gardens as sites for hybridization Exchanges of genetic information New varieties	Gardens as environmental engagement Hybrid space	
	Gardens as migrants' spaces Maintenance of migrants' cultural identity	

Figure 2 : Strands of inquiry in garden types

Source: Clariss T. Kimber. "Gardens and Dwelling: People in Vernacular Gardens," Geographical Review. Vol. 94, No. 3,

[80] Clariss T. Kimber. "Gardens and Dwelling: People in Vernacular Gardens," *Geographical Review*. Vol. 94, No. 3, People, Places & Gardens (Jul., 2004), 268.

tranquility, the sublime, communion with a pantheistic Nature)."[81] It becomes evident that the term 'garden,' although composed of natural elements, is very much a human environment, created to satisfy human needs, whether utilitarian, aesthetic, or symbolic.

'Landscape' seems to connote more distance between the human and natural worlds. The noun 'landscape' is defined as "a section or expanse of rural scenery, usually extensive, that can be seen from a single viewpoint [or] the category of aesthetic subject matter in which natural scenery is represented."[82] The natural world in this context is appreciated in its raw form, rather than the more human manipulated sense that the noun 'garden' suggests. A landscape is the wild, unadulterated version of nature that serves as the pure form of natural beauty. It is something to be appreciated from the human world, but not necessarily of the human world.

The verb 'landscape', on the other hand, strongly implies human involvement. Its definition is, "to improve the appearance of (an area of land, a highway, etc.), as by planting trees, shrubs, or grass, or altering the contours of the ground."[83] The action orientation of landscape then is very much a component of the human world. The verb 'landscape,' a human creation, is the act of recreating the noun 'landscape,' a non-human creation. It suggests a more balanced relationship between man and nature than 'garden'. Gardens are pockets of natural elements that are fully manipulated for man's needs, whereas a 'landscape' still retains the potential for reference and interaction with site.

In ecological terms, the term 'landscape' is broadly used for a variety of research criteria. Yet, the ecological approach to 'landscape', with its close attention to holistic relational and structural interactions, proves useful in refining the use of 'landscape' in the social sciences. According to an ontology created in an attempt to universalize the

[81] Clariss T. Kimber. "Gardens and Dwelling: People in Vernacular Gardens," *Geographical Review*. Vol. 94, No. 3, People, Places & Gardens (Jul., 2004), 269.
[82] Random House Dictionary, s.v. "landscape", www.dictionary.com (accessed October 5, 2011).
[83] Random House Dictionary, s.v. "landscape", www.dictionary.com (accessed October 5, 2011).

term within the scientific disciplines, 'landscape' consists of three variables: 1 - area, 2 - structure and function, and 3 - scale independence.[84] The first variable requires that a specific set of boundaries exist for the study area, defining the limit of the type of 'landscape'. The second variable refers to the series of living patterns, processes, and relationships that exist within the specified area. The term 'landscape' connotes this aspect of dynamic interactions between biotic and abiotic components, so that a 'landscape' requires the existence of at least one ecosystem within the specified area.[85] Finally, a landscape is scale independent, meaning that a designated 'landscape' area with its ecosystems may be large or small and still constitute a 'landscape'. Likewise, it may change in size, function or structure over time and in response to evolving ecological processes.[86] This more closely defined understanding of 'landscape' creates deeper comprehension of the vital components for any landscape and may help bridge the gap between the natural, or wild, version of 'landscape', versus the manipulated and manufactured man-made 'landscape'. In this way, a constructed landscape may more appropriately approximate the makeup of vital natural processes, and bring it closer to a self functioning entity.

Within this renegotiation of human and landscape, there is the history of cultural practice that informs much of the latent perception and therefore applied action to the relationship. The investigation of how to more successfully integrate natural elements within the built environment necessitates an analysis of how humans landscape – as in, how humans actively manipulate site in order to mediate between the natural and built environments. Historical precedents portray the significance that this portion of human construction has had for mankind and provide a foundation to build upon in the refinement of human landscapes. Further exploration may help designers more fully incorporate those latent desires into the cultural conscious.

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[84] Christopher A. Lepczyk, Christopher J. Lortie and Laurel J. Anderson. "An Ontology for Landscapes" *Ecological Complexity* 5 (2008), 272.
[85] Christopher A. Lepczyk, Christopher J. Lortie and Laurel J. Anderson. "An Ontology for Landscapes" *Ecological Complexity* 5 (2008), 275.
[86] Christopher A. Lepczyk, Christopher J. Lortie and Laurel J. Anderson. "An Ontology for Landscapes" *Ecological Complexity* 5 (2008), 275.

3.2 The Universal Human-Nature Development

Man's interest in cultivating plant life for societal purposes reaches back to the earliest human records – for both their use as food crops and for aesthetic pleasure. Indeed, one of the first and most crucial cultural evolutions for mankind can be traced to his understanding of the cultivation and propagation of plant life for agricultural purposes, allowing humans to change from a nomadic species to a sedentary species.[87] These original cultivated landscapes allowed a settled culture to develop, forever changing the relationship of mankind to nature. At the same time that settlement allowed culture to flourish, it also gave mankind a greater influence on the success or failure of certain plants within the human environment. Humans began to closely identify which species were most preferable for existence, both for subsistence and for pleasure, linking a plant's fate to its relationship to human culture. It is difficult to trace when the knowledge of plant cultivation began to integrate within the built environment, as perhaps they developed simultaneously and interdependently. The modern notion of a garden or agriculture may not suit the condition between the original habitat's relationship to the cultivated landscape. Currently the idea of a garden or landscape is considered outside of the built space – something that is auxiliary; related but separate from the interior space. However, in the earliest structures, this boundary may have been differently defined, so that the garden space was considered intimately enough to be part of the built environment. Before the advent of sewage maintenance, the area in close proximity to the interior was used as the bathroom, which acted as a natural fertilizing agent to the original garden.[88] Similarly, cooking was frequently done in the exterior space, supplied by the close proximity of the garden space. In this way, the modern notion of the garden space being supplementary to the built environment is not suitable, as it was more intimately woven into the daily patterns of activity that define a human space. Domestic activities of a simpler lifestyle

[87] William E. Doolittle. "Gardens are Us, We Are Nature: Transcending Antiquity and Modernity," *Geographical Review*, Vol. 94, No 3, People, Places, & Gardens (Jul., 2004): 392.
[88] William E. Doolittle. "Gardens are Us, We Are Nature: Transcending Antiquity and Modernity," *Geographical Review*, Vol. 94, No 3, People, Places, & Gardens (Jul., 2004): 393.

are fully inclusive of the exterior as an essential component of human habitation and therefore challenge our current separation of land from building as the central human space.

In later examples, crops cultivated for agriculture began to enter into the built space for increased protection: against harsh weather conditions, marauding enemies, or destructive wildlife. In fourteenth century Timbuktu, gardens were built behind large wall structures and sunken into the ground to protect them from wind damage.[89] The gardens of ancient Mesopotamia were built within the limits of city walls to protect crops against wild pigs and against flooding waters from the Tigris and Euphrates rivers.[90] Instead of utilizing the exterior space in proximity to the structure as part of daily activity, humans began to incorporate those exterior spaces within their structures – a key difference in the relationship of architecture to natural systems. Humans were increasingly controlling the environments of plant life for their own purposes. Interestingly, the incorporation of agriculture within the building limits coincided with the connection of the garden as a place of leisure; a primarily aesthetic purpose. In the same Mesopotamian city limits, royalty incorporated internal courtyards, designed for leisure activities and as a demonstration of wealth.[91] It was as though the closer connection of systems to environment signaled a change in human understanding of landscape – one that asserted more control and therefore thought to purpose.

As civilization progressed and became increasingly urbanized, the definition between agrarian space and human dwelling space became more distinct, and so too did the relationship between human and plant. The individual garden plot gave way to the larger agricultural field and thus the plant life closest to the house did not have to be food crops, leaving room for a more common consideration of plants for aesthetic purposes. The pivotal difference between the cultivation of plant life in the landscape,

[89] Paul Cooper. *Interiorscapes: Gardens within Buildings*. (London: Octopus Publishing Group, 2003), 8.
[90] Stephanie Dalley. "Ancient Mesopotamian and the Identification of the Hanging Gardens of Babylon Resolved," *Garden History*, Vol. 21, No. 1 (Summer, 1993): 2.
[91] Stephanie Dalley. "Ancient Mesopotamian and the Identification of the Hanging Gardens of Babylon Resolved," *Garden History*, Vol. 21, No. 1 (Summer, 1993): 2.

for agricultural purposes, versus their cultivation for architectural enhancement, is the introduction of containerization[92] - the process of taking plants from the environment and isolating them into containers that can be moved and positioned. This basic but key innovation illustrates the desire to specifically place plant life for human use and enjoyment, something that not only speaks to an appreciation of plants beyond their simple function or placement in nature, but also necessitates enough practical understanding of plant life requirements to properly engineer an appropriate living environment. There is indication that humans have had this knowledge since ancient history with evidence of potted plants found in both Chinese and Middle Eastern civilizations more than 4000 years ago and tomb paintings of plants growing in containers found in Egypt dating from 1450 B.C.[93] These records are relying on physical remnants, but there are also written accounts of containerized plants, the most famous being the Hanging Gardens of Babylon. Described by several classical authors, the Hanging Gardens of Babylon were depicted as terraced architecture planted with a variety of plants in order to give the impression of a mountainside.[94] Known as one of the seven wonders of the ancient world, the Hanging Gardens of Babylon exist in the larger cultural consciousness as a classic example of a paradisal architectural garden environment. In many ways, this epitomized the evolution of man's relationship to plant life from purely coexistent and perfunctory to a proprietary and controlled manipulation of aesthetic.

It is somewhat safe to assume that this basic evolution of man's relationship to plant life was universal: identification, cultivation, containerization, and landscape design. The differences are the ways in which these aspects evolved from culture to culture. To generalize, there were leading and disparate relationships that developed in the West and in the East. In the West, an oppositional relationship to nature developed,

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[92] Nelson Hammer. *Interior Landscape Design*. (New York: McGraw-Hill Architectural and Scientific Publications, 1991), 16.
[93] Nelson Hammer. *Interior Landscape Design*. (New York: McGraw-Hill Architectural and Scientific Publications, 1991), 18.
[94] Stephanie Dalley. "Ancient Mesopotamian and the Identification of the Hanging Gardens of Babylon Resolved" *Garden History*, Vol. 21, No. 1 (Summer, 1993): 7.

in which man supposed themselves to be separate and superior to the natural world. This developed into a dominating mentality, producing highly controlled, formal landscape design based on the intellectual idea of geometric purity, as well as the development of comprehensive horticultural records and techniques detailing ways in which to achieve this order.[95] In the East, man was seen as a part of nature, and therefore a landscape design strategy of imitation and appreciation of natural forms flourished.[96] It too was highly controlled and intricate for its horticultural understanding, but rather through the use of artful composition and spiritual symbolism.

Hawai`i is unique for the reason that its cultural history is so much shorter and its environment vastly more isolated than elsewhere in the world. Because of this, the impact of every culture that has come to the islands is evident in its environmental impact and has contributed greatly to the identity of modern day Hawai`i. Within the history of man's introduction to the islands, one finds the story of Hawaii's cultural relationship to plants. Just like most of the plant life on the islands, the culture of Hawai`i was brought from elsewhere, but grew into something uniquely Hawaiian.

3.3 Hawai`i Landscape

In order to understand the intimate relationship of the Hawaiian built environment and its tropical landscape, it is essential to understand the origins of the cultural connection to land and plant life that arose in Hawai`i, and then how that changed as the islands became more culturally diverse. Certainly plant life helps identify 'Hawaiianness', with the ubiquitous coconut tree, Monstera leaf, taro patch, and hibiscus flower being inextricably connected to the definition of Hawai'i. Tropical

[95] Catrin Gersdorf. *The Poetics and Politics of the Desert: Landscape and the Construction of America*. (Amsterdam: Rodopi, 2009), 33.
[96] Masao Watanabe. "The Conception of Nature in Japanese Culture," *Science*, New Series, Vol. 183, No. 4122 (Jan. 25, 1974), 279.

flora dominants every product that is labeled Hawaiian, from aloha shirts to corporate logos. Upon closer examination, there is a much deeper and more complex relationship of Hawaiian flora and Hawaiian culture than is evident from the commercialized stereotype of Hawai`i. Tropical plant life defines much of the Hawai`i sense of place. Architects have the opportunity to articulate this crucial aspect of the Hawaiian identity in a meaningful way, a way which impacts the life, culture and environment of the islands in the long term.

The legacy that modern Hawai`i carries in its landscape and garden design language is laden with traditions originating from the original Polynesian cultures that populated the islands and the introduced cultural practices from Europe and Asia. Each influence literally and symbolically shaped the land and continually redefined the relationship of architecture to the tropical landscape. Much of what is taken for granted as quintessential to the Hawaiian sense of place, intimately related to the plant life of the tropical landscape, has been brought here, struggled over, and is potentially damaging to the original Hawaiian ecosystems that evolved in isolation before the arrival of humans. Due to its extreme isolation, Hawai`i is a vital example of the way in which culture and environment interact – neither one being a passive recipient of the other's influences, but rather existing in an interchange where, "in adapting, the culture transforms its landscape and so must respond anew to changes that it had set in motion."[97] If the relationship of man to nature is then a continual dialogue, the question arises as to the appropriate relationship for Hawai`i moving forward. What is the suitable blend of environmental conservation practices, ethnobotanical concerns of cultural heritage, and self-sustainability issues for the continuity of humans on the islands? In order to further this discussion, it is vital to investigate the cultural origins of the modern Hawaiian relationship to landscape and how it has evolved in relationship to architecture. The future of sustainable design and a successful integration of natural systems within the built environment will rely on an understanding of the ingrained

[97] Marshall D. Sahlins. "Culture and Environment" in *Horizons of Anthropology, Second Edition*, edited by Sol Tax and Leslie Freeman. (Chicago: Aldine Publishing Company, 1977), 216.

cultural relationships to plant life from which the modern Hawaiian mentality arose and how that may enrich future applications.

In an island, with such obvious environmental limitations yet such desirable living conditions, the relationship of the landscape to the built environment in Hawai`i is at once more complicated and more integrated. The benevolent tropical climate makes for a close relationship between interior and exterior, with the resultant blurring of the garden and the building. In Hawai`i, there is great potential for the house and garden to become one fluid unit, more so than in the temperate climates that have defined the most well documented garden design styles. However, the Hawaiian garden style has still been heavily influenced by the design styles of its temperate climate immigrants. It is difficult to clearly state the Hawaiian garden design style because it is heavily representative of its cultural makeup – a blend of many cultures. The Hawaiian garden has developed over time as the many different types of people arrived on the island, with imported plants and design aesthetics, so that today the Hawaiian style is really a unique blend of design styles from the East, the West, and Polynesian.[98] It potentially carries lessons and variations of each, and therefore an investigation of the history of the human relationship to plant life, and the resultant relationship to architecture, will help to fully identify the many variations influencing the islands and then to distinguish that which is distinctly Hawaiian. Interestingly, there is not a lot of published history on garden and landscape design in Hawai`i.[99] This may have to do with the fact that much of the design language has been transplanted from other regions, or perhaps because it is a relatively new design style compared to the centuries old traditions arising out of other regions. Either way, the richness of landscape design in Hawai`i is no less vital or unique and deserves scholarly attention. Through an analysis of its origins and influences, it becomes apparent that the themes that were brought to Hawai`i did

[98] Loraine Kuck and Richard Tongg. *The Modern Tropical Garden: Its Design, Plant Materials and Horticulture*. (Honolulu: Tongg Publishing, 1955), 10.
[99] Marc Treib. "Of Climate and Contour: Ossipoff's Architecture and the Hawaiian Environment" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. Edited by Dean Sakamoto. (Honolulu: Honolulu Academy of the Arts, 2007), 86.

indeed evolve into a uniquely Hawaiian vocabulary, and one that is intimately related to architecture.

3.4 History of the Hawaiian Landscape

The Hawaiian Islands have rare and unique ecosystems that developed because of the extreme isolation of the island chain. Before the first wave of humans inhabited the islands, the only plant and animal species that were present were those that flew or floated the great distance across the Pacific. Once there, these few species populated the islands and frequently evolved in isolation over many years into new species specifically suited to the island environment.[100] The term 'native' is used when referring to these original Hawaiian plants, with the subcategories of 'endemic' and 'indigenous'. Native plants that are indigenous are those that arrived without human aid but also exist elsewhere in the world. Native plants that are endemic are those that arrived independently and then evolved into a completely unique species over time and therefore are found nowhere else on earth. [101] Scientists believe that there were at one time thirty-two genera endemic to Hawai`i, with possibly as many as 20,000-30,000 flowering species and 168 fern varieties.[102] Their extreme isolation allowed for the development of completely distinctive species and ecosystems, but also left them vulnerable to foreign influence. As people came to Hawai`i, bringing previously unknown plants and pests, the native species of Hawai`i were presented with new competition and peril. Many of those original Hawaiian species are now extinct, and of the 1,100 native plant species that are identified as still in existence on the islands, 600

[100] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), 5.
[101] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), 4.
[102] Linda W. Cuddihy and Charles P. Stone. *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introductions*. (Honolulu: University of Hawaii Cooperative Park Resources Studies Unit, 1990), 1.

are in danger,[103] giving Hawai`i the designation of "endangered species capitol of the world."[104] Meanwhile, many of the introduced plants became naturalized, meaning they spread independently, no longer requiring human cultivation.[105] The makeup of Hawaii's current landscape is thus a menagerie of plants from all over the world intermixed with indigenous species. These designations become difficult to navigate, as many of the species of plants that are not technically native to the islands, are culturally important to the islands, having been here so long that they have become strongly celebrated as an intrinsic part of the identity of Hawai`i.

3.4.1 Pre-Contact

The first humans to come to the Hawaiian Islands were believed to be Polynesians, most likely from the Marquesas Islands, arriving around 800 A.D.[106] These first settlers found little plant life suitable for subsistence in Hawai`i, as there is no native plant that is high in protein or carbohydrate that could serve as a food staple.[107] Instead, the Polynesians brought over their own plants and animals that soon became an important part of the Hawaiian landscape. These plants, which have become known colloquially as "Polynesian introductions" or "canoe plants", were primarily food plants, but also plants that were culturally significant for the traveling community.[108] There are 32 plant species that have been identified with the arrival of the Polynesians along with

[103] Charles Lamoreux in "Protecting Hawaii's Rare Plants: A Maui Nursery Gives Refuge to the Native Flora other Creatures Depend On," by Gary T. Kubota. *Star Bulletin*, February 2, 2000.
[104] Gary T. Kubota. "Protecting Hawaii's Rare Plants: A Maui Nursery Gives Refuge to the Native Flora other Creatures Depend On," *Star Bulletin*, February 2, 2000.
[105] "Polynesian Introduced Plants." Hawaiian Encyclopedia. http://www.hawaiianencyclopedia.com/polynesian-introduced-plants-i.asp (accessed November 8, 2011).
[106] Linda W. Cuddihy and Charles P. Stone. *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introductions*. (Honolulu: University of Hawaii Cooperative Park Resources Studies Unit, 1990), 17.
[107] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), 6.
[108] Thomas Galiato. "Form and Composition of a Present Day Hawaiian Garden" (Master's thesis, University of Hawai`i at Mānoa, 2004), 39.

dogs, chickens, pigs, geckos and rats.[109] Among these 32 species of plants brought over are many of the culturally significant plants in modern day Hawaiian culture, including: taro, bananas, sugar cane, yams, sweet potatoes, and coconut palms. The landscape of Hawai`i was forever changed by these plants, carrying strong cultural meaning that came to define Hawaiian identity and relationship to place.

The ancient Hawaiian culture was extremely linked to plant life. This extended to all available plants, not only the introduced varieties. The ancient Hawaiians were quick to adopt uses for the native plants available on the islands for structural uses in housing and fishing vessels, as well as for cloth, fishing nets and medicines.[110] The Hawaiians developed ingenious ways to utilize every aspect of the plant life available, because their culture did not have the availability or knowledge of either metals or ceramics that have come to define other cultures.[111] Hawaiians were solely dependent on plant life for everything, and therefore developed extremely skillful horticultural knowledge for cultivating and utilizing plants, including systematic methods of naming and cataloguing plants as well as close observations that allowed for the purposeful creation of hybrid plants in order to expand their available plant palette.[112]

Over the next 1000 years, until the arrival of the first European ships, the new Hawaiians settled into the islands, steadily spreading across the eight major islands and increasing in population from approximately 100 people in the initial immigration to what early European travelers estimated at between 200,000 and 1 million people.[113] Their close relationship to the land enabled this growth. They became proficient farmers, developing intricate subsistence agricultural methods based on sophisticated

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[109] Linda W. Cuddihy and Charles P. Stone. *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introductions*. (Honolulu: University of Hawaii Cooperative Park Resources Studies Unit, 1990), 32.
[110] Beatrice H. Krauss. *Plants in Hawaiian Culture*. (Honolulu: University of Hawaii Press, 1993), 1.
[111] Beatrice H. Krauss. *Plants in Hawaiian Culture*. (Honolulu: University of Hawaii Press, 1993), vii.
[112] Beatrice H. Krauss. *Ethnobotany of the Hawaiians*. Harold L. Lyon Arboretum Lecture Number Five. (Honolulu: Harold L. Lyon Arboretum, University of Hawaii, 1978), 4-5.
[113] Linda W. Cuddihy and Charles P. Stone. *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introductions*. (Honolulu: University of Hawaii Cooperative Park Resources Studies Unit, 1990), 18.

irrigation systems that altered the landscape to incorporate lo`i (terraces) and `auwai (ditches) for growing their staple food crop – kalo (taro).[114] The system diverted water from streams and rivers into constructed lo`i, allowing every farmer access to water, while still passing the water to his downhill neighbor, recharging the groundwater along the way and ultimately arriving at the ocean. It was a resource usage and conservation strategy that encouraged every farmer to share resources for the survival of all.[115] This terrace and pond system was the first man-made alteration to the Hawaiian landscape and represents the original Hawaiian garden. Many of these terraces exist today, whether in use or hidden among vegetation.

In addition to these larger agricultural land alterations, the Hawaiian culture had many smaller strips of land called `ili, and even smaller divisions within that known as koele and hakuone, each designated for a different cultural purpose.[116] The organization and development of land was wholly based around their culturally established relationship to plants. The architecture was built in relationship to these different areas of agriculture so that every plant fit into the structure of the landscape around the house. "Except for the *kalo*, Hawaiian crops were grown in small plots scattered about the house in spots that best fit the ecology of the plant."[117] It was an informal, but intrinsic aspect of the Hawaiian home, where the location and orientation of the Hawaiian architecture can be seen as motivated by the needs of their plant life. This was vital to the understanding of Hawaiian culture, because unlike farming on Hawai`i today, which is managed by only a small portion of the population, every ancient Hawaiian was, at least to some extent, a gardener. According to ethnobotanist Isabella Abbott, "virtually all members of society spent some time gathering plants or

[114] Linda W. Cuddihy and Charles P. Stone. *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introductions*. (Honolulu: University of Hawaii Cooperative Park Resources Studies Unit, 1990), 19.
[115] E.S. Craighill Handy and Elizabeth Handy. *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. (Honolulu: Bishop Museum Press, 1972), 58.
[116] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), 11.
[117] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), 11.

gardening."[118] In such an agrarian society, the importance of the land, and of the plants that were cultivated, was vital to their understanding of themselves in the world, and infiltrated every articulation of that world: in the organization of their political structure, the configuration of their land, and the architecture of their landscape and structures. "The Hawaiians, more than any other Polynesians, were a people whose means of livelihood, whose work and interests, were centered in the cultivation of the soil. The planter and his life furnish us with the key to his culture."[119]

The intimacy of the Hawaiians to their land extended much past their extensive horticultural understanding and agricultural methodology, permeating every aspect of the Hawaiian culture - language, religion, rituals, and even understanding of self was tied to the land and connectivity to its patterns. This unification between flora and culture in pre-contact Hawai`i was well documented by historian E.S. Craighill Handy and his wife Elizabeth Green Handy through an analysis of language, mythology, festivals, and cultural rites of passage, all of which refer to land, agriculture, and Lono – the God of agriculture.

> The fundamental patterns of the culture were determined by the habits of growth and cultivation of taro. The terms used to describe the human family had reference to the growth of the taro plant: *`oha*, the taro sprout, became *`ohana*, the human extended family. Their term for land had reference to sustenance, *`aina*, *`ai* to feed, with the substantive suffix *na*. The people who dwelt or subsisted on the land were *ma-ka-`ai-na-na*, "upon-the-landers."And a native in his homeland was a "child of the land," *kama-`aina*. The fundamental unit of territory was the *ahupua`a*, so called because its boundary was marked by an altar, *ahu*, dedicated to the rain god Lono, symbolized by a carved representation of the head of a hog, *pua`a*, which was a form of Lono, the rain god and patron of agriculture. The culmination and beginning of each year was marked by a festival in honor of Lono in which the first fruits of the harvest were offered to him on the many *ahupua`a* throughout the land. In the pageantry of this festival the paramount chief of the island represented Lono.[120]

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[118] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), xii.
[119] E.S. Craighill Handy and Elizabeth Green Handy. *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. (Honolulu: Bishop Museum Press, 1972), 135.
[120] E.S. Craighill Handy and Elizabeth Green Handy. *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. (Honolulu: Bishop Museum Press, 1972), 18-19.

They hypothesize that the reason for such an intimate connection between culture and environment arose from the difficulties inherent to life on Hawai`i at the time, and the importance of their reliance on the few plants brought over by their ancestors that sustained them.

> An organic relationship between the people and their land – one might say biological as well as psychological – is to recognize first the difficulty of life in its rugged environs, the exceptionally hard work involved in earning one's sustenance from it, and the resulting awareness of the precariousness of living against such odds, which in turn renders precious the very features and forces of nature against which or in league with which one struggles for survival.[121]

The level of connection between flora and culture was in direct connection to the transparency of sustenance needs. The proximity to their plants and incorporation into every aspect of life created a greater awareness and care for the plants that provided life.

This is not to suggest that the relationship between the Polynesian settlers and land use was perfectly harmonious. The Polynesians alterations to the landscape had many detrimental effects. There is evidence that the landscape of the Hawaiian Islands, particularly the low lying lands, were heavily forested prior to human introduction.[122] In order to implement their cultivation strategies, the ancient Hawaiians used techniques such as 'slash and burn,' in which they employed the use of fire to clear large forested areas as a way to prepare the ground for agricultural cultivation, drastically reducing the natural forest habitat of the lowlands of Hawai`i.[123] This agricultural style spread throughout the island chain as the population grew, enough so that archeologists claim that , "there is scarcely an area in the lowlands . . . that upon archaeological

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[121] E.S. Craighill Handy and Elizabeth Green Handy. *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. (Honolulu: Bishop Museum Press, 1972), 43.

[122] Zimmerman, E.C. 1963. Nature of the land biota. Pages 57-64 in F.R. Fosberg, ed. Man's Place in the Island Ecosystem. Bishop Mueum Press, Honolulu. Reference found in 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem' by Patrick V. Kirch, in 'A Natural History of the Hawaiian Islands: Selected Readings II" edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 425.

[123] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 432.

reconnaissance does not yield evidence of indigenous Polynesian agricultural use."[124] The effects of this style of cultivation resulted in the extinction of many endemic species,[125] erosion, siltation and alterations to the shoreline,[126] and potentially a decrease in human population due to the degradation of the land and the resultant lessening of its carrying capacity.[127] Archaeological evidence shows that the population of the ancient Hawaiians grew exponentially after initial settlement, peaking around A.D. 1650 and then began to decline, suggesting that "the capacity of the indigenous technological productive system to support increased population had reached its limits."[128]

It is evident that much of the Hawaiian culture was based around the ever-present reality of resource limitations, including essential behavioral parameters worked into the political and societal regulations. Conservation strategies employed by the early Hawaiians, including the kapu system enforced by the ali`i, limited the usage of certain resources as a way to prevent exploitation,[129] but these measures were not necessarily wholly effective. As pointed out by ecologist Patrick Kirch, "the existence of a conservation ethic and its effectiveness are two different things; the former does not

[124] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 429.
[125] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 433.
[126] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 434.
[127] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 430.
[128] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 428.
[129] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 434.

automatically imply the latter."[130] The picture that is painted by the anthropological and archaeological evidence is of a society very much aware of the land and resources that supported them, with many cultural and technological developments that created a great connection between people and land and an efficient implementation of self-sufficient agricultural methods, but not a system sophisticated enough to preserve the land in perpetuity for the population growth that occurred. Like in any environment, resource limitations determine population thresholds; nowhere is this more transparent than in an isolated island culture.

3.4.2 Post-Contact

The arrival of European people created the second wave of critical impacts to the Hawaiian landscape. Beginning with the Captain Cook's arrival in 1778, a new era began for the Hawaiian Islands. Increasing numbers of ships stopped in Hawai`i, trading goods and increasing the demand for Hawaiian foodstuffs and materials to supply sailing expeditions.[131] More plants were brought to the islands by the merchant and whaling ships, increasing the variety of food crops and ornamentals. There were also scientific expeditions that came to Hawai`i after its discovery, bringing seeds and plants for trade or distribution.[132] In the first sixty years after initial European contact, more than one hundred new species were introduced to the islands.[133] The landscape of Hawai`i began altering more rapidly due to the increase in both its inputs and outputs. The islands

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[130] Patrick V. Kirch. 'The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem', in *A Natural History of the Hawaiian Islands: Selected Readings II*, edited by E. Alison Kay. (Honolulu: University of Hawaii Press, 1994), 434.

[131] Linda W. Cuddihy and Charles P. Stone. *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introductions*. (Honolulu: University of Hawaii Cooperative Park Resources Studies Unit, 1990), 37.

[132] Ross H. Gast. *Don Francisco de Paula Marin*. (Honolulu: The University Press of Hawaii for the Hawaiian Historical Society, 1973), 26.

[133] Nagata, K.M. "Early Plant Introductions in Hawai`i," *Hawn. J. History*. 1985. 19:35-61, Found in "Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introductions." By Linda W. Cuddihy and Charles P. Stone (Honolulu: University of Hawaii Cooperative Park Resources Studies Unit, 1990), p. 37.

were no longer solely dependent on self-sustainability. Systems of trade and the resulting influx of new resources and land use patterns began to erode the native methods.

Europeans also began to settle on the islands, introducing not only plant species but a formal garden design style, heavily influencing the future of the Hawaiian garden. A young Spaniard by the name of Don Francisco de Paula Marin moved to Hawai`i in 1793 and became well known as "Hawaii's 'first gentleman farmer'"[134] for his persistent expansion of horticultural variety and interests in Hawai`i. He introduced some plant species, but was more influential for the style of his gardens. He created the first Europeanized garden, including a vineyard that became renowned as being the "showplace of Honolulu."[135] To this day, Don Francisco's legacy lives on with the major road called Vineyard in Honolulu that runs along the border of his once famous garden.

Don Francisco is interesting in an examination of a modern Hawaiian connection to flora, partly because it marked the beginning of an altering relationship of human environment to land, and partly because it was the beginning of a new gardening style. Don Francisco defected from the Spanish navy and settled in Hawai`i at the age of nineteen,[136] old enough to have established tastes from his homeland, but young enough, and enough desirous of a new life, to adapt those tastes to life in Hawai`i. This was not the case with the next Western arrivals – the missionaries.

The first missionaries arrived between 1820 and 1850,[137] bringing established practices for not only religious belief, but for agriculture and landscape design. The garden style of the missionaries was essentially a Europeanized garden style – highly

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[134] Ross H. Gast. *Don Francisco de Paula Marin*. (Honolulu: The University Press of Hawaii for the Hawaiian Historical Society, 1973), 19.
[135] Ross H. Gast. *Don Francisco de Paula Marin*. (Honolulu: The University Press of Hawaii for the Hawaiian Historical Society, 1973), 51.
[136] Ross H. Gast. *Don Francisco de Paula Marin*. (Honolulu: The University Press of Hawaii for the Hawaiian Historical Society, 1973), 4.
[137] Office of Hawaiian Affairs. 1994. Senate Joint Resolution 19. Prepared by Land and Natural Resources Division. Listed in "Form and Composition of a Present Day Hawaiian Garden" by Thomas Galiato. Master's Thesis, (University of Hawai`i at Mānoa, 2004), 24.

ordered and formal, with designated beds and borders that contradicted the more aesthetically informal Hawaiian method of planting according to each plant's ecological preference. Because of this, they found the Honolulu landscape to be lacking in the beauty that they loved from their home on the East Coast of the United States. Laura Fish Judd arrived in March of 1828 and expressed in her journal the sentiments of these early missionaries. "There! I see the town of Honolulu, a mass of brown huts, looking precisely like so many haystacks in the country, not one white cottage, no church spire, not a garden nor a tree to be seen."[138] They quickly set about trying to recreate their accustomed styles in Hawai`i. These early missionaries brought an established agriculturist with them, Captain Daniel Chamberlain, who introduced the favored food crops from New England. He proceeded to imitate the agricultural methods that he knew, only to fail miserably.[139] The Europeanized style of gardening, appropriate for a temperate climate, was not wholly appropriate in the tropical Hawaiian climes. The native Hawaiian residents, and established transplants such as Don Francisco, adapted planting methods to work in Hawai`i: finding success where there was a reliable source of water next to streams, or in the valleys and at higher elevations where there was heavier rainfall. The reason that Honolulu appeared barren was in large part due to the deforestation brought on by the Polynesian culture, but also because the land there did not have the irrigation potential that was available in other locations on the islands, and was therefore not an ideal location for cultivation. Yet this is what made Don Francisco such an interesting character in Hawaii's relationship to flora. While the early missionaries gave up after Champlain's failure, convinced that Hawai`i was simply not rich land,[140] Don Francisco was ingenious enough to combine the ecologically opportunistic native way of gardening with his Europeanized stylist preferences. It was

[138] Judd, L F. 1880. *Honolulu: sketches of life, social, political, and religious, in the Hawaiian Islands from 1828 to 1861*. (New York: A.D.F. Randolph & Company), 258.
[139] Ross H. Gast. *Don Francisco de Paula Marin*. (Honolulu: The University Press of Hawaii for the Hawaiian Historical Society, 1973), 4.
[140] Ross H. Gast. *Don Francisco de Paula Marin*. (Honolulu: The University Press of Hawaii for the Hawaiian Historical Society, 1973), 84.

an early expression of a new tropical garden style, not solely practical nor solely aesthetic, but fully appropriate for the budding Honolulu landscape.

Missionaries and their descendents learned from Don Francisco and others and eventually began to understand the potential for agriculture in Hawai`i, finding the unbelievable fertility of the Hawaiian Islands when using the right plants and the right agricultural methods. They made the next critical change in Hawaiian history by finding the economic profit in exportable crop plants, especially sugarcane,[141] which instigated a whole new identity for Hawai`i. Increased control of a booming sugar trade meant increased income and therefore increased power. It also instigated waves of incoming immigrants, forever changing the racial and cultural makeup of the islands. The first Japanese immigrants were brought to Hawai`i in 1868 to work in the sugar fields, and by 1910 made up 80% of the coffee farmers in Kona.[142] Again, plant life was integral in defining the culture of Hawai`i, but with a different political, economic, and environmental motive.

3.4.3 A Coalescing Hawaiian Style

With all of these changes in cultural, political, ethnic, and economic influences, the identity of Hawai`i was forming anew. In these early years of outside contact, the landscape design of Hawai`i was more of a mix of independent styles, and had not yet blended into a unique voice of its own. As late as the 1930's, landscape design author Loraine Kuck wrote that, "Today there is no such thing as a tropical style of gardening."[143] In a very telling article in the then popular newspaper, *Hawaii Farm and Home*, an enthusiastic author writes, "We who live in Hawaii can choose the nationality

[141] Honolulu Board of Water Supply 2002. Listed in "Form and Composition of a Present Day Hawaiian Garden" by Thomas Galiato. Master's Thesis, (University of Hawai`i at Mānoa, 2004), 29.
[142] "History of Agriculture in Hawaii." State of Hawai`i Department of Agriculture. http://hawaii.gov/hdoa/ag-resources/history (accessed November 10, 2011).
[143] Loraine Kuck and Richard Tongg. *The Tropical Garden: Its Design, Horticulture and Plant Materials*. (New York: The Macmillan Company, 1936), 1.

of our gardens and homes. It isn't as though we lived in England, where a brilliant Spanish house and garden set amongst a row of cozy English cottages would be an uncongenial step-child."[144] A specific Hawaiian sense of place was lost and reforming with the influx of so many other cultural styles, all transported and existing side by side.

But it was also by the 1930's that a newer uniquely Hawaiian style had begun to congeal. Loraines Kuck's book, *The Tropical Garden*, in which she claimed that there was no tropical style, was in fact the first to begin to articulate in written form the patterns that were becoming an identifiable Hawaiian garden style. Written in conjunction with early Hawaiian Landscape Architect, Richard Tongg, *The Tropical Garden* marks an important changing point in the relationship of the tropical landscape to the human environment. Tongg, who was only the third licensed landscape architect to work on the islands, recounted these early days when the tropical identity was forming in the built environment.

> In Hawaii, the housing and gardening history started with the grass shack and the taro patch of the ancient Polynesians. After a hundred years of missionary influence, that is from 1821 to 1921, the grass shacks had been mostly replaced by wooden buildings, and gardens were made up of plants nostalgic to the settlers who brought them from their homelands . . . Building and garden design started budding, I would say, during the early twenties in Hawaii . . . Landscape architecture was particularly an unknown profession . . I was the third to enter the field when I returned from California in 1929. Landscape architecture, up to the end of the 1920's, were (sic) mostly confined to the more affluent people. . . It was not until the beginning of the 1930's that the business houses became conscious of the advantages of the landscape architecture.[145]

It was also during the early 1930's that the Federal Aid to Roadside Beautification Act went into effect, bringing federal funding into Hawai`i for landscaping.[146] It was a time

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[144] Elinor Karg. "Garden Glances: Your Garden's Nationality," *Hawaii Farm and Home*, November 15, 1938, 36.

[145] Richard Choy Tongg. "Richard Choy Tongg" in *Oral Histories of 1930's Architects*. Transcripts of tapes of oral histories taken by members of the Hawaii Society / American Institute of Architects. September 1982. 147-148.

[146] Richard Choy Tongg. "Richard Choy Tongg" in *Oral Histories of 1930's Architects*. Transcripts of tapes of oral histories taken by members of the Hawaii Society / American Institute of Architects. September 1982. 150.

when the variations in design style and plant palettes that had been developing since European contact were forming into a style unique to Hawai`i and finding economic viability amidst a rising social interest in landscaping. *The Tropical Garden* came out in 1936, as further evidence of this coalescing cultural value and identity.

The definition of a Hawaiian garden that began its literary debut with *The Tropical Garden* was highly evident of the success and influence of introduced plants. "The words 'tropical garden' bring to mind at once a vision of heavy, tangled undergrowth; lush, big leaved exotic plants; creepers clinging to the trunks of trees; a lacy canopy of palms filtering the sunlight high overhead. And close at hand, strange brilliant blossoms, heavy and waxen."[147] This description showcases the dramatic difference the Hawaiian landscape undertook in the hundred years after the first Western contact, much more closely describing the Hawaiian plant life of today than what the first Europeans encountered. By this point in Hawaii's history, the exotics imported over the years had begun to define the Hawaiian landscape, and had become an essential component to the identity of the 'tropical garden'. According to Kuck and Tongg, the definers of a tropical garden are: large-leafed plants, crowded growth, and brilliant colors.[148] This mentality is largely true even today.

Kuck and Tongg also maintained the importance of the importation of not only plant species, but design style. "The garden in the tropics is laid out, in general, according to the same kind of design as that in the temperate zone; but the plant materials are entirely different."[149] While the first missionaries had failed in their initial attempts to fully import Western agricultural and landscape design styles, successive settlers were successful by using a hybrid of Western design aesthetics with a tropical plant palette.

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[147] Loraine Kuck and Richard Tongg. *The Tropical Garden: Its Design, Horticulture and Plant Materials*. (New York: The Macmillan Company, 1936), 2.
[148] Loraine Kuck and Richard Tongg. *The Tropical Garden: Its Design, Horticulture and Plant Materials*. (New York: The Macmillan Company, 1936), 7-8.
[149] Loraine Kuck and Richard Tongg. *The Tropical Garden: Its Design, Horticulture and Plant Materials*. (New York: The Macmillan Company, 1936), 6.

This hybrid mentality was also evident in the relationship of architecture to landscape. The architecture of Hawai`i at the time was transplanted from elsewhere, with a typology that frequently felt foreign to the Hawaiian environment. What had been organically developing in Hawai`i was the use of a garden as in intermediary between the natural environment and the built environment – a sort of reconciliation between tropical fauna and Western building practices. In order to mediate this ill, Kuck and Tongg suggest that,

> it behooves the garden designer, if his garden lies around a house that is unsuitable, to conceal its wrong features, and fit the structure into the alien setting as best he can . . . the aim should be to acclimatize the house to its new environment and not to stress its alien features. The garden, which is the liason between the house and its natural environment, must partake of the characteristics of both.[150]

In this way, the tropical landscape was to act as a masking of the inappropriate architecture that had become prevalent in Hawai`i. Plant life was then the signifier of 'hawaiianness,' creating the sense of place lacking in the architectural typology.

3.4.4 Modernity and the Lanai

The idea of the garden as a liaison between the house and its natural environment also signified an enormously important moment for Hawaiian architecture. Loraine mentions for the first time the way in which landscape is used in conjunction with the architecture to make an outdoor room, a place that mediated both worlds in an interwoven blend of interior and exterior, allowing for the type of comfortable outdoor living so desirable in the benevolent Hawaiian climate. She was articulating something that was naturally occurring because of the intuitive reality that the Hawaiian lifestyle is lived out of doors, and therefore people will find ways in which to manifest this need. She investigated the ways in which these outdoor rooms were evidenced, labeling three varieties of outdoor rooms: a room with walls and no roof, or a roof with no walls, or

[150] Loraine Kuck and Richard Tongg. *The Tropical Garden: Its Design, Horticulture and Plant Materials*. (New York: The Macmillan Company, 1936), 3-4.

the garden itself.[151] Evidence of this trend can be seen in popular media of the time. In *Hawaii Farm and Home*, an article written by W.W. G. Moir tells homeowners how to plan their landscape in order to best create 'Your Outdoor Living Room', encouraging them to realize the potential of the garden space to enhance the livable area of the home. "Your garden is so similar to your interior rooms that by following the same general principles one soon doubles and trebles the living space. In Hawaii, this also leads to greater joy and health, for our gardens are useful all year round."[152]

What this actually evidenced was the inadequacy of the architecture of the time to not only aesthetically fit within the environment, but climatically function for the needs of a tropical lifestyle. Because architectural styles of the time were imported from temperate climate zones, they were designed to keep weather out. In the Hawai`i climate, notable for a consistently moderate temperature range but high humidity, a different design approach is necessary. In order to create comfort in Hawai`i, a designer must open the building to the environment, moderating the consistent trade winds through the space to provide the necessary ventilation to relieve the negative effects of higher humidity.[153] In fact, much of the vernacular architecture of hot and humid climates around the globe consists of a minimal structure, typically a raised platform covered by a roof and little else, admitting as much natural ventilation as possible – a sort of insulating umbrella.[154]

The people living in Hawai`i adjusted to this lacking in the architectural typology by simply tacking on porches and verandas to the sides of their houses in order to

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[151] Loraine Kuck and Richard Tongg. *The Tropical Garden: Its Design, Horticulture and Plant Materials*. (New York: The Macmillan Company, 1936), 11, 21.
[152] W.W. G. Moir. 'Your Outdoor Living Room.' *Hawaii Farm and Home*. March 1944: 5.
[153] Marc Treib. "Of Climate and Contour: Ossipoff's Architecture and the Hawaiian Environment" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 74.
[154] Marc Treib. "Of Climate and Contour: Ossipoff's Architecture and the Hawaiian Environment" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 74.

supplement the interior space.[155] The need for this livable outdoor space was so vital that Kuck and Tongg go as far as to claim that, "properly placed and protected so that privacy is assured, the porch will become the center of the home, where most of the hours of work and leisure are passed."[156] The use of an architectural exterior space is so fundamental to the Hawaiian home, that the flow of activity in the house may be considered as centered on its location. Similar to the view of the hearth in temperate climates, the outdoor room of any Hawaiian home becomes the vital heart of the house. The additive strategy for accommodating this need was not a fully realized articulation of Hawaiian architectural space. It was once this 'outdoor living room' was identified as uniquely and essentially Hawaiian, that it was more fully integrated into the architectural vernacular.

This aspect of Hawaiian architecture became fully realized in the work of the recognized leader in modern Hawaiian architecture, Vladimir Ossipoff. Ossipoff took the verandas and porches of Hawai`i and re-envisioned them as a modern interpretation of a traditional Hawaiian motif – the lanai.[157] A traditional Hawaiian homestead consisted of many separate structures, each a thatched hut with roofs that reached down to the ground plane, functioning much like separate rooms in a Western style home.[158] They were used primarily as shelter from the weather. The majority of living activities happened outdoors, frequently in a paved space covered with a simple roof supported by posts and beams, called a lanai.[159] Ossipoff appropriated the traditional Hawaiian word lanai to articulate the outdoor living space that was so essential to the Hawaiian lifestyle, both in the past as now. He made fantastic examples of its usage as an integral

[155] Dean Sakamoto. "The Living Lanai" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 93.
[156] Loraine Kuck and Richard Tongg. *The Tropical Garden: Its Design, Horticulture and Plant Materials*. (New York: The Macmillan Company, 1936), 12.
[157] Dean Sakamoto. "The Living Lanai" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 94.
[158] Beatrice H. Krauss. *Plants in Hawaiian Culture*. (Honolulu: University of Hawaii Press, 1993), 55.
[159] Dean Sakamoto. "The Living Lanai" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 93.

aspect of the design, rather than simply an addition to an otherwise Western style building.

Perhaps Ossipoff's greatest examples of the articulation of the lanai are in his two private club designs: the Outrigger Canoe Club in Waikiki and The Pacific Club in downtown Honolulu. Both clubs are intended as gathering space for leisure activities. With the pleasant climate of Hawai`i, this presented the perfect setting for a connection of indoor and outdoor activity. The difference between interior and exterior dissolves, so that it is hard to distinguish what is part of the building and what is part of the landscape.

The Outrigger Canoe Club begins this blend of site and architecture with an entrance that immediately transports the visitor from Waikiki's hectic streets to a serene journey through tropical vegetation. One begins by passing through a pergola heavily draped with hanging thunbergia, a sort of vegetated gate signifying the change in atmosphere. The path then zigs and zags through lush vegetation, creating a journey to the entrance of the actual structure.[160] Even as one enters the structure of the building, Ossipoff maintains the connection to the exterior with a multitude of details that weave natural and built elements. There are no heavy walls, and little evidence of doorways. Everything is built in an open flow of space, with the structure dissolving even further by the regular occurrence of natural light wells. Ossipoff also includes pockets of landscaping within the interior area, as if the building were allowing the site to peek through from above and below. The space then becomes an interconnected series of dining areas that have been described as "an extensive field of pergolas."[161] The interior spaces develop into Hau covered pergolas and finally dissolve into the beach itself as if the building had grown up in-between the sand and the vegetation.

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[160] Dean Sakamoto. "The Living Lanai" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 99.

[161] Marc Treib. "Of Climate and Contour: Ossipoff's Architecture and the Hawaiian Environment" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 82.

With the Pacific Club, Ossipoff created a similar dispersal of interior and exterior. Upon entering the building through a large portico style entrance, the space soon opens up into an open flow of space, with the interior and exterior continually interchanging. "The definition of the various meeting rooms, lounges, and dining spaces dissolved into meandering pattern of modular, covered bays and circular flows. . . Here the distinction between indoor and outdoor is soft and hesitant, and the building seems to dissolve into the realm of one continuous lanai."[162] The landscape is artfully used to encourage this blend, using both lush vegetation and manicured greenery woven with the structure. The central space of the building is an open lawn, as if to suggest that the building is simply an accompaniment to the site. Ossipoff also creates consistent changes in floor level, further encouraging the feeling as though the building were simply a part of the existing rise and fall of the land.

With his two leisure club designs, Ossipoff created a striking statement of what architecture in Hawai`i could be, and should be. While there were others before him that had made progress in defining a Hawaiian style architecture, Ossipoff was able to create living spaces that spoke of Hawai`i because they so seamlessly articulated the strong connection of human and natural environment. It was taken on as a truly defining feature of Hawaiian architecture, evident not only in the structures built since his work, but also by Hawaiian institutions. In 1949, an exhibition of the lanai idea, entitled "Five Lanais" was held at the Honolulu Academy of Arts, in order to showcase "five solutions to the problem of the lanai, Hawaii's most characteristic architectural motif."[163] It was successful enough that it also instigated a spread of the lanai to other similar climatic regions. By 1976, the California Magazine, *Sunset*, wrote an article called "Hawaii's Lanai Idea," to showcase the potential for connecting the built environment with the natural environment. "A lanai makes the transition between

[162] Marc Treib. "Of Climate and Contour: Ossipoff's Architecture and the Hawaiian Environment" in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 81.

[163] Robert Griffing Jr. "Lanai Exhibition, Honolulu Academy of Art," manuscript, 1949, Honolulu Academy of Arts Archive. Listed in "The Living Lanai" by Dean Sakamoto, in *Hawaiian Modern: The Architecture of Vladimir Ossipoff*. (Honolulu: Honolulu Academy of the Arts, 2007), 95.

house and garden. In some lanais you're really in the house looking out into the garden; the garden becomes part of the house. In other, physically detached lanais, you're surrounded by garden. Most mass-built houses here in the West acknowledge the outdoors with windows to look out of and sliding glass doors for easy access to the outside, but they seldom explore the concept of outdoors-indoors transition."[164] The lanai idea, which is still to this day the essential design component of Hawaiian architecture, is only truly successful when seamlessly woven with natural elements. In many ways, the vegetation is just as important as the architectural elements, and the way in which these two meet become the articulation of a Hawaiian sense of place.

3.4.5 Contemporary Cultural Renaissance and Ethnobotany

For today's Hawaiian architecture, this articulation of the lanai idea, and the woven connection of natural and built elements has the opportunity to redefine itself with an ecological systems approach. But, it is also crucial to understand how the culture has progressed in order to ensure that the built environment represents the continually evolving Hawaiian sense of place. In modern times, there has been a cultural renaissance for the Hawaiian people. After so many years of suppression and emersion into Westernized methods, the revitalization of Hawaiian culture has become a leading issue for the state. Since the 1970's, the Hawaiian cultural renaissance has resulted in an increased availability of resources for perpetuating the Hawaiian language, increased visibility and educational opportunities for hula, ukulele and lei making, and a tide of support for protecting the `aina. As part of this cultural renaissance, there is an interest in protecting and cultivating the native plant life and ecosystems that were so vital to the pre-contact Hawaiian identity,[165] adding a whole new layer to this discussion of how to incorporate natural elements and built elements.

[164] "Hawaii's Lanai Idea: The Room with a Missing Wall" *Sunset*, Vol, 156, September 1976, 64.
[165] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), xi.

The resurgence in cultural heritage came around the same time that the United States as a whole was beginning to legally recognize environmental issues. In 1973 the United States passed the Endangered Species Act and in 1974 created an Endangered Species Registrar, in order "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved."[166] Increasingly, public interest and awareness was being focused on the fragility of much of Hawaii's native flora. By 1994, there were 161 Hawaiian plants listed as endangered or threatened on the registrar, making up 34 percent of the total listing.[167] The two issues, a cultural resurgence and protection of native flora, grew together; the two being intimately connected.

The bond between Hawaiian culture and native flora has thus become strongly recognized. A resurgence of cultural awareness has resulted in an increased interest in ethnobotanical issues.[168] Ethnobotany is described as "the study of man and plants, or … the study of the importance of plants to primitive peoples."[169] As part of the response to modern cultural interest and study on the subject, ethnobotanical gardens have popped up around the state as educational resources, showcasing the beauty and variety available from native plants and telling the story of Hawai`i through its plant life. These cultural gardens range from those devoted solely to native species, to those devoted to the original Hawaiian cultural plant palette, and to those that attempt to detail the progression of changes over Hawaii's history. The botanical gardens in Waimea Valley focus on the collection and propagation of native and rare native Hawaiian plants. According to the statement of their Botanical Collections Specialist, David Orr,

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[166] *Endangered Species Act of 1973*. Public Law 93–205. (Approved Dec. 28, 1973), 222.
[167] Laila N. Tamimi. "The Use of Native Hawaiian Plants by Landscape Architects." Master's Thesis, (University of Hawai`i at Mānoa, 1999), 25.
[168] Thomas Galiato. "Form and Composition of a Present Day Hawaiian Garden" Master's Thesis, (University of Hawai`i at Mānoa, 2004), 3.
[169] Beatrice H. Krauss. *Ethnobotany of the Hawaiians*. Harold L. Lyon Arboretum Lecture Number Five. (Honolulu: Harold L. Lyon Arboretum, University of Hawaii, 1978), 3.

> Native and Polynesian-introduced plants are the foundation of Hawaiian culture. Waimea has a rich collection of heirloom varieties of kalo, sweet potato and banana. We have one of the state's most extensive collections of loulu palms, the only palms in Hawai`i before Hawaiians brought coconuts. Our diverse collection of plants is a display of over 1000 genera in over 200 plant families from all over the world in 35 separately themed gardens. One is solely devoted to the Hawaiian hibiscus, and included all three endangered subspecies of our state flower.[170]

Other gardens focus on the ancient Hawaiian culture, like one built by the former director of the Honolulu Botanical Gardens, Paul Weissich, in the early 1970's, which incorporated culturally significant plants for early Hawaiians, and the rebuilding of original Hawaiian land formations including: lo`i, mākāhā (sluice gates) and loko wai (fresh water ponds).[171] Similarly, the Bishop Museum has built ethnobotanical gardens around Hawai`i in order to trace the historic and cultural significance of flora in Hawai`i. At the Amy Greenwell Ethnobotanical Garden on the Big Island, there are over 200 species of plants that were either native plants or Polynesian introduced plants, grown in the traditional Hawaiian manner and displayed as an educational tool for the study of Hawaiian people and their plants.[172]

The modern interest in the historic Hawaiian relationship to nature reaches beyond just the uses of plant life, but also in traditional Hawaiian land use patterns, specifically that of the ahupua`a. The structure of the ahupua`a that successfully created a localized system of sustainability has become an inspiration for the current sustainability movement on the islands, as a hope that modern Hawaiian culture can learn from the principles of resource conservation and sharing that were embodied in the original Hawaiian ahupua`a. It is yet another example of the ability for Hawaiian cultural heritage to inform and guide modern innovation, not through a literal transition back to a more primitive time, but for its value systems and management strategies.

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[170] David Orr, "Conservation Through Cultivation'' http://www.waimeavalley.net/botanical.aspx (accessed October 22, 2011)

[171] Thomas Galiato. "Form and Composition of a Present Day Hawaiian Garden" Master's Thesis, (University of Hawai`i at Mānoa, 2004), 5.

[172] "Amy B.H. Greenwell Ethnobotanical Garden" http://www.bishopmuseum.org/exhibits/greenwell/greenwell.html (accessed October 22, 2011).

Summary

The prevalence of ethnobotanical awareness in modern Hawaiian culture is an essential issue for any designer to consider when incorporating natural systems within the built environment. Just as ecological and sustainability issues are essential, the conservation and perpetuation of cultural traditions is vital for the continuity and significance it gives to design. The investigation of the Hawaiian culture, both historically and in modernity, illuminates the direct correlation between environment and culture. Therefore, any desire to further a Hawai`i specific architecture must recognize and embrace this intimate relationship. Successful Hawaiian architecture is that which responds to its region, most famously by blurring the line between the interior and the exterior, and supporting the lifestyle of an idyllic outdoor climate. In this climatic condition, plant life has consistently carried enormous cultural significance. Beginning with the ancient Hawaiians whose isolated culture relied so completely on plants, to later uses of plants to 'Hawaiianize' inappropriate architectural typologies, into a modern embrace of the lanai idea's connection of architecture and garden, and ultimately to the current cultural renaissance embracing native plant conservation and propagation. More sensitively incorporating natural elements within the built environment reinforces a Hawaiian sense of place for local architecture, helping to blend the distinctive tropical ecosystems within buildings and allowing the beauty of Hawaii's natural world to penetrate and create unique spatial qualities. The next round for incorporating nature systems within the built environment is to utilize these cultural conventions and perceptions within an ecological framework, in order to encourage the regenerative nature of local microclimates.

Chapter 4: Contemporary Landscaped Architecture

As the world enters the next stage for architectural design, Hawai`i has the opportunity to redefine itself in its future built environment. A more sensitive appreciation of Hawaiian cultural heritage combined with ecological goals for sustainability has the opportunity for a new aesthetic expression through the reinvention of the relationship between the Hawaiian built environment and Hawaii's natural environment. In many ways, the most successful architecture in Hawai`i already intimately ties the interior with the exterior, inviting the tropical climate and vegetation to define and inspire spatial flow and formal articulation; the future of design will only be improved by continuing to evolve this expression. Hawai`i certainly has a unique and vital cultural heritage, but is also part of an increasingly connected world stage. Ideas, style, and innovations are instantly shared worldwide through technological communications and increased mobility. While this has had negative effects, as discussed earlier with the increasingly bland nature of design that occurs from mass-production and lack of local identity, it also has the potential to allow truly inspiring design innovation to influence creativity far and wide. For this reason, it is useful to examine the global trend that has recently risen in contemporary architecture and analyze what significance can be gleaned from the rising trend and how Hawai`i will define itself in this new design language.

4.1 Contemporary Aesthetic : A Landscaped Architecture

In the most recent architecture surfacing around the world, there is an increasing interest in integrating natural systems into the built environment. Traditionally, landscape has been exterior to the built environment, designed as a separate entity to the building. This relationship has taken a fascinating turn in which

landscape and architecture are no longer two separate designs, but rather an integrated whole. Landscape more fully enters the architectural realm, creating a unique blend that is no longer the landscape and the architecture as separate entities, but rather a 'landscaped architecture' – a harmonious weave of the natural and built environments. This new visual language changes the expectations for where and how nature exists in relationship to architecture. No longer is nature confined to parks, lawns, or pots, but is now an active component of the built environment. The exciting aspect is that this new visual language has the absolute capability of contributing to the sustainability movement as a unique and appealing way to successfully integrate natural systems. These design articulations may be based on the rising interest in sustainability within society, but seem to be more successful in terms of pure aesthetic stimulation. One could certainly critique their success in terms of an ecologically based function, however, these aesthetic expressions do present the beginning steps towards a further integration of aesthetics and functional ecological design principles. If combined with a functional ecological strategy, they have the ability to take sustainability measures to a holistic level of expression, where form is truly representative of the values and goals of this day and age. They are the early innovations that will help to re-integrate nature into the modern built environment, which will then present the opportunity for those natural elements to fulfill the functional changes necessary for a sustainable design paradigm. Here, then are some of the ways in which this re-integration of nature within the built environment is being expressed.

4.1.1 Interiorscape

The first articulation of a landscaped architecture in contemporary architecture was in interiorscapes, or the inclusion of garden plots within the interior of a building. It was, in some ways, an increase in scale of the notion of potted plants combined with the desire to bring a grounded landscape into the control of the interior space. It was not so much inventing a new technique for integrating plant life within a building, as

there are multiple traditional articulations of plant life within the interior, but rather articulating its place and importance in a contemporary urban atmosphere. The notion of a landscaped interior was an important first step in breaking down the border of the building envelope to re-imagine landscape's relationship to the built environment.

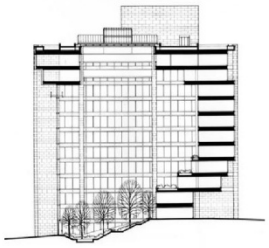
EXAMPLES:

interiorscape

FORD FOUNDATION BUILDING

Completed in 1963, the Ford Foundation Building in NYC is twelve stories of office space located around a large central atrium raising the entire height of the building to a skylight. The concept of the interiorscape was to create a humane environment for the office employees - a green oasis in New York's concrete jungle.

Source: http://volume-control.tumblr.com/page/3



Source: http://volume-control.tumblr.com/page/3

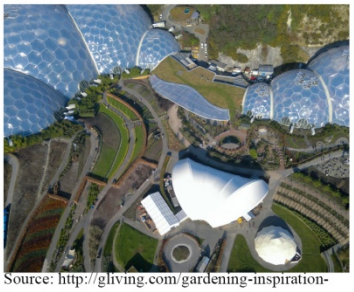
Source: http://forums.steves-digicams.com/landscape-photos/167039-ford-foundation-indoor-garden.html

interiorscape

EDEN PROJECT

The Eden Project in Cornwall, is the largest contemporary greenhouse, consisting of three different biomes - re-created ecosystems housed within and without steel tube and thermoplastic domes. It utilizes interiorscapes as a facility for educational and socially progressive activities.

Source: http://www.spreadartculture.com/2011/01/21/desperately-seeking-green/eden_project_cornwall_nicholas_grimshaw_and_partners/



Source: http://gliving.com/gardening-inspiration-how-the-built-the-eden-project-gardens/

Source: http://thenokiareview.com/2011/03/31/hd-horizons-project-nokia-n8-hits-the-skies-to-capture-englands-landmarks/eden-project/

4.1.2 Green Roof

Beyond interiorscapes, which bring landscape within the building envelope, there are many methods to integrate landscape on, around, and above the built environment, adapting to the many surfaces and spaces that have, up to this point, been devoid of living elements. The green roof is perhaps the most frequent articulation of a contemporary landscaped architecture. In many ways, it was a logical design step, as the roof space can be thought of as simply a displaced ground, presenting the opportunity for including vegetation on the same footprint area as the building occupies. According to Steven Peck, the Founder and President of Green Roofs for Healthy Cities, the most significant potential for integrating natural systems is on the roof. It is the greatest missed opportunity in architecture. "Green roof technology provides an exciting and virtually endless palette of design opportunities for innovators, who can play a key role in the reinvention of miles of wasted roof space on our buildings."[173] The roof is an entire other side of architecture that has traditionally been considered as simply the cover for space, without realizing its full potential as a space. Green roofs are now reclaiming this lost territory.

[173] Steven Peck. Foreword in *Green Roofs in Sustainable Landscape Design*, by Steven Cantor. (New York: W.W. Norton & Company, 2008), 8.

EXAMPLES:

green roof | CALIFORNIA ACADEMY OF SCIENCES

The green roof on the California Academy of Sciences consists of 2.5 acres of area planted with indigenous plant species. It serves as energy saving insulation, habitat for local wildlife, and aesthetic appeal. The Academy is now the largest LEED Platinum building in the world and also the world's greenest museum. The green roof is a visual statement of this commitment.

Source: http://www.worldarchitecturenews.com/index.php?fuseaction=wanappln.projectview&upload_id=14651

Source: http://www.greenroofs.org/index.php?option=com_content&task=view&id=1039&Itemid=136

green roof | CHICAGO CITY HALL

The green roof on Chicago's City Hall is a demonstration project for the Urban Heat Island Initiative established by the US EPA. Not only does the rooftop garden serve as a research tool, it is also a visual statement in the city. Visible from 33 taller buildings in the area, it creates an aesthetic display of environmental principles within Chiacago's built environment.

Source: http://www.ozarksunbound.com/water-the-key-to-sustainable-design-lecture-monday-at-university-of-arkansas-campus-announcement/15085

Source: http://www.greenroofs.com/projects/pview.php?id=21

4.1.3 Vertical Garden

Landscaped architecture has also explored other lost territory. Every surface has become open to the integration of living systems. This is especially evident in vertical gardens. The potential of this medium is great, for their use as a sun screen, food production, wildlife habitat, or aesthetic appeal. Innovative systems for planting and irrigating in the vertical plane now allow for entire plant environments to grow and thrive as a façade to a building, whether interior or exterior. Vertical gardens vastly increase the potential space for natural systems to exist in relationship to the built environment. They challenge the traditional notion of where plant life must exist by

dislocating the ground plane. The issue that arises with the use of the vertical garden is how it relates to the building itself. The new systems for vertical gardens are separate from the building itself, existing as only a beneficial additive to the building. Yet, this separation allows for a mutually beneficial relationship between natural and built elements. The separation successfully deals with the practical problem of the degradation to building components that can occur when in contact with living plant life, while creating the space for natural elements to integrate with the built environment.

EXAMPLES:

vertical garden

LEON KLUGE

The use of vertical gardens as an aesthetic statement is perhaps most notable in the work of Leon Kluge of South Africa. Kluge developed a version of vertical gardening based off of the example of Patrick Blanc, separated from the structural wall and fed hydroponically. His gardens are at once a two-dimensional image and a three dimensional texture, taking the living wall into the realm of mural.

Source: http://leonklugegardendesign.co.za/

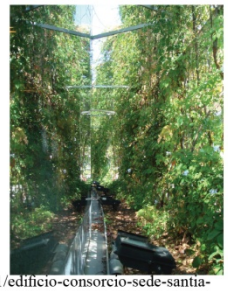
Source: http://leonklugegardendesign.co.za/

vertical garden

CONSORCIO HEADQUARTERS

The vertical garden on the Consorcio Headquarters in Santiago, Chile is a second skin of planted trellises, recovering vegetation displaced by the building and serving as a functional sun screen to minimize solar heat gain. It is a reinterpretation of a common traditional Chilean architectural element – the Parron, or plant covered pergola. It enables the qualities of plants that appeal to the human senses to extend into the vertical realm.

Source: http://noticias.arq.com.mx/Detalles/11762.html



Source: http://www.plataformaarquitectura.cl/2009/01/21/edificio-consorcio-sede-santiago-enrique-browne-borja-huidobro/

4.1.4 Stratum

The displacement of the ground plane has become an important concept in the contemporary articulation of a landscaped architecture. The built environment has continually tested the vertical limits of growth, moving the level of human activity away from the ground plane. Yet, the landscaped earth has remained relatively stable throughout this development. The recent realization that landscape can be incorporated into any surface of a building has created a new relationship with the

EXAMPLES:

stratum | NANYANG TECHNOLOGICAL UNIVERSITY

The green roof on Nanyang Technological University's School of Design and Arts facility, utilizes a striking integration of site and building by its fluid rise and fall of the ground plane up and over the otherwise modern glass building. The green space acts as an aesthetic example of the innovative design it teaches within.

Source: http://www.cpgcorp.com.sg/portfolio/viewdetails.asp?Lang=EN&PCID=5&PDID=338

Source: http://right-side-of-brain.tumblr.com/

stratum | MĀLAMA LEARNING CENTER

The stratified ground plane has found articulation in Hawai`i through the design of the Mālama Learning Center in Kapolei by Eight Inc. The design creates a dynamic interaction along two axes, splitting the ground plane into multiple layers of earth and built space. The learning center is a contemporary interpretation of the integration of environmental stewardship and cultural expression – celebrating local identity through a contemporary sustainable design language blending landscape and architecture in a woven whole.

Source: http://www.eightinc.com/?pageid=320

Source: http://www.eightinc.com/?pageid=320

ground plane. The ground may now rise and fall, be separated and elevated, or bend and twist to conform to the many planes of the built environment, redefining the ground plane into a multi-layered experience. Contemporary landscape architect analyst Liat Margolis defines this development as a stratum - the layering of living earth and living environment into overlapping and dynamic relationships. "The stratified ground is conceived as a three-dimensional profile, within which living and dynamic systems – vegetation, flow, microbial action – originate, develop, flow through, or are contained. Its profile extends beyond the top/interface layer to a series of overlapping horizons that interchange resources for reinforcement and symbiosis."[174] With this notion, designations such as landscape, green roof or vertical garden become united as the surface of landscaped architecture weaves between realms.

4.1.5 Grown Architecture

The notion of integrating natural systems and architecture has also been brought to a literal extreme, in which buildings incorporate living plant life as a structural element. Buildings are literally grown, as an ultimate expression of a contemporary 'green' building. This is not necessarily a new idea, but new to contemporary architecture. Primarily employed as an experimental structure, or simply as an artistic wonder, these grown buildings test the extent of our use, reliance, and boundaries with the natural world.

[174] Liat Margolis and Alexander Robinson. *Living Systems: Innovative Materials and Technologies for Landscape Architecture*. (Basel: Birkhäuser GmbH, 2010), 36.

While grown architecture projects are fascinating as concepts, or as small exhibits, it is highly impractical to think of this method of construction for use on a large scale. However, these projects raise an interesting level of awareness to the idea of a living building. It is easy to make the mental connection of natural and built environment when they are literally the same, but the lessons from these projects ring true for less literal circumstances. The ability to bring living elements within, around, and as part of the built environment, allows the constant contact and therefore awareness to nature attending a sense of responsibility and personal investment in the natural local situation.

EXAMPLES:

grown architecture

BAUBOTANICAL TOWER

The Baubotanical Tower has excited much interest for being the first building to be literally grown. It is a four story structure, built with a metal framework within which willow trees are bent and molded as both support and façade. The vision is to create buildings that have the spatial and sensory qualities of trees, taking the connection of inhabitant to nature to a pure level.



Source: http://www.treehugger.com/files/2009/09/first-living-building-grown.php

grown architecture

THE PATIENT GARDENER

The Patient Gardener is a two-story retreat created by the careful manipulation of Japanese cherry trees into a dome-like structure. The literal use of living nature as structure, roof, wall, and even furniture, connects the inhabitant to their environment at an extreme level - intended to bring environmental consciousness into design.



Source: http://www.architizer.com/en_us/blog/dyn/32203/patient-gardener/

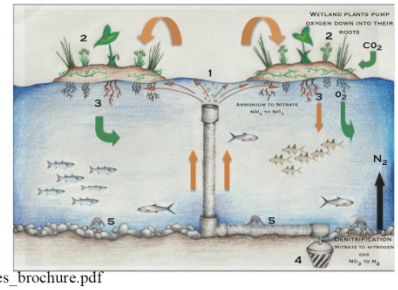
4.1.6 Water Systems : Living Machines

Perhaps the most literal way to integrate within a local ecosystem is to interact with the local water cycle, encouraging the creation of thriving ecologies as part of the water's pathway through site. Water will travel through a site by rainfall, flow along ground level, and as part of underground water table. The built environment may intercept and utilize any or all of these access points, so long as the water is allowed to continue on its path unpolluted from human activities. Critical ways in which to utilize this strategy is through storm water management, treatment of grey and black water, and through various water catchment solutions. The utility of this strategy is instantly

EXAMPLES:

water systems | PUNAWAI POND

Punawai Pond is one of 13 restored Hawaiian fishing ponds at the Hulalai Resort on the Big Island. The ponds are now home to many native species and simultaneously work as an aquaculture farm, providing native fish, shrimp and oysters to the restort resaurants. Punawai Pond also hosts a floating island of wetland plants within a structure connected to a circulation system, a system called the Restorer, which acts as an ecological cleaning agent for the ponds. Arranged around a world renowned golf course, the ponds and the purifying wetland plants are also an integral aspect to the aesthetic appeal of the landscape.



Source: http://www.rothecologicaldesign.com/downloads/water_features_brochure.pdf

water systems | FUZHOU CANAL RESTORER

Fuzhou, a city of 6 million in China, uses a series of canals for the dumping of its commercial wastewater and sewage, creating serious health and safety concerns for its residents. A constructed wetland, using the Restorer system, was installed to help clean the polluted waterways and simultaneously create an attractive and functional community walking bridge.

Source: http://toddecological.com/PDFs/100623.casestudy.baima.pdf

evident, and resourceful in terms of managing one of the most crucial systems within a human environment. In our current construction practices, both the source and destination of water is hidden from view. It is exciting to re-imagine this relationship with water, where an increased visibility and engagement with systems can be utilized as an aesthetic asset.

4.1.7 Movement/Communication

Just as contemporary landscaped architecture is challenging the notion of the natural ground plane, so too is it finding dynamic ways to interact with other constants of the natural environment. A style of transferring natural forces into new and unusual strategies of movement allows for a unique form of communication between natural elements and the built environment. It brings more attention to environmental issues within the built environment through a variety of physically changeable constructs that articulate natural rhythms through architectural forms. The use of these movable structures communicate the power and presence of environmental forces in a unique blend of the man-made and the natural.

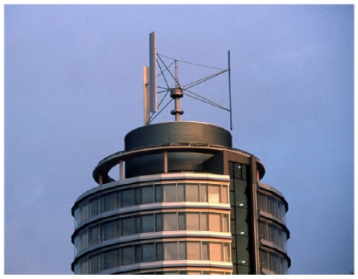
EXAMPLES:

movement

COURTYARD IN THE WIND

The Buildings Department Administration in Munich, Germany has a dynamic entrance landscape designed by the Acconci Studio, consisting of a circular platform that is mechanically attached to a wind turbine on the top of the building. As the turbine spins, the energy harnessed from the wind rotates the platform, moving the alignment of the elements and creating a unique way in which to bring attention to the rhythms of nature. The artistic expression is a distinct way in which to visualize the power of the wind.



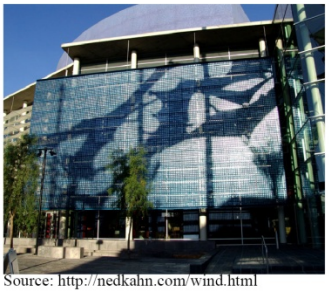
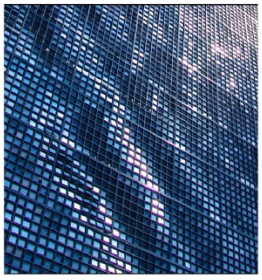


http://www.architizer.com/en_us/projects/pictures/courtyard-in-the-wind/25726/222348/

movement

WIND VEIL

Ned Kahn similarly utilizes natural forces to create dynamic aesthetic communications. His wind veils are facades for buildings that serve as both sun screen and artistic element. Made from many small reflective aluminum panels that are able to freely move, the force of the wind moves the panels in waves, communicating the power of the wind in an elegant display of natures forces.


Source: http://nedkahn.com/wind.html

4.2 Design Principles of a Landscaped Architecture

Each of these visual manifestations of a 'landscaped architecture' in contemporary design are interesting for the ways in which they may be able to help the future success of the global ecological design movement by re-interpreting how the built environment and natural environment interact. It is a visual language arising out of the ideals of the sustainability movement, both within in its functional attributes, as well as with the aesthetic message it portrays. But the question remains: are these contemporary design expressions only fashionable visual statements, or are they actual manifestations of an environmental movement, with the potential to integrate a landscaped visual language with ecological principles? While each example shown provides an interesting new formal articulation, it is important to look deeper to pinpoint the elements and strategies behind these formal articulations to ascertain if they are indeed progressing the goals of true sustainability. If this is the new visual language defining the era of ecological design, how are designers to decide what the driving guidelines should be when implementing these designs? Thus far, this thesis has outlined three basic necessities for any landscape architecture: 1-function based on ecological principles; 2-aesthetic form that appeals to the psychological, emotional and physical health of inhabitants; and 3-a connection to place through the inclusion of cultural identifiers. Yet, the ways in which a landscaped architecture may respond to these three needs are multitudinous and varied. In order to further define guiding principles for the creation of fully successful landscaped architecture, it is important to investigate what has arisen more deeply, identifying what ways these design innovations are successful in a shifting design paradigm. Certain themes begin to arise when investigating the successful integration of natural elements within the built environment. If a 'landscaped architecture' is to survive as more than a momentary trend in the history of architectural design, a conscious understanding and usage of these themes as drivers of meaning and purpose will allow the aesthetic appeal to carry

a greater significance and embody the values of an era. The legacy of contemporary architecture will only be lasting and influential when the intentions are relevant, apparent and representative of the desires and merits of current and mounting ideologies. Here, then are some of the themes that arise:

4.2.1 Transparency Equals Awareness

The more transparency between human habitation and natural systems, the more awareness inhabitants will have of nature's rhythms, needs, and vulnerabilities. In an architecture driven by ecological understanding, as both a way to reach sustainability and as a way to create physically and psychologically healthy environments for human inhabitants, a landscaped architecture has the ability to bring local ecologies within the built environment in a way that habitants are then engaged with their systems – the transparency of the natural environment allowing an increased consciousness and understanding which in turn encourages a personal sense of responsibility and care. Continual engagement with natural systems will allow the subtleties of the natural environment to become a part of human consciousness, creating a level of interaction that will lessen callous or unintentional degradation of the natural environment while increasing personal accountability.

4.2.2 Sensual Enjoyment – or – Architecture as a Journey

Architecture is a unique expression of humanity because it is at once fixed and evolving. It is a monument representative of a certain culture in time, but is also something that is alive in the way it is experienced. As one travels through architecture, the experience is like a journey – a progression of movement through time and space. Unlike other human products, it is a continual development of reactions unfolding, a choreography of experiences all contributing to the essence of the work. A landscaped

architecture has the potential to enhance and define the sensory stimulants unfurling through this progression. Space is living, through the movement of people and forces within and around it. The addition of living components – smells, rhythms, textures, and sounds – has the capability to bring space alive on a greater level for the inhabitants. It can create a phenomenological experience, where an ever-evolving space reveals a rise and fall of intrigue and wonderment – a continually renewing psychological passage.

4.2.3 Retreat

The notion of a journey necessarily brings to mind a destination. This too is where a landscaped architecture has the potential to define a psychological mindset. There is the ability, with natural elements, to create a retreat – a place of comfort and repose – where the mind may be at ease in contemplation and soothing environs. The surrounds of natural elements has the ability to remove one from the ceaseless flow of modern life and enter into a place of safety and privacy, a refuge into the soothing sounds, textures and smells of natural scenery. In this way, natural elements combined with architectural elements may be the signifiers of both the journey and the destination.

4.2.4 Utility

The use of landscaping within the built environment has the great potential for utilitarian purposes. This is the aspect of natural systems that has gained the most attention in research. There are many ways in which plant life can function to support or displace other unsustainable systems within the built environment, including: purifying water, purifying air, providing shade, increasing insulation, growing food, creating habitat, phytoremediation, and many more. There is an almost unending list of ways in which plant life can mechanistically aid with the built environment, with new

uses being created daily. Here it is included as only one of many themes in order to reduce the current focus in sustainable design of function over form or significance.

4.2.5 Boundary

Plant life has the ability to define the boundaries of space, whether creating a slow blend from man-made to natural, or sharply delineating a change in designation. The landscaping can work with architectural elements to create psychological clues as to the change from one spatial definition to another. The use of strong geometric lines within architecture can be softened or manipulated to create a mental distinction that defines a perimeter, whether literal or psychological.

Alternatively, plants can be highly architectural in and of themselves. They can replace architectural elements such as a wall, ceiling, or structural support; or may serve as spatial elements such a privacy barrier, pathway or frame.

4.2.6 Education as Aesthetic

There is always the potential to create specific natural systems designed to educate inhabitants about environmental, cultural or scientific issues. Landscape elements have the potential to be pedagogical tools. Some may be fixed installations that showcase an environmental principle, local sustainability concern, or simply be an example of a native ecosystem. Alternatively, a landscape element can be educational by encouraging a participatory relationship with a building's inhabitants, where the users continually learn through engagement with their surroundings. Containing these educational installations within and around the built environment allows a greater flow of traffic to participate and begins to open up a potentially stagnant landscaping plot into a potential outlet for intellectual and creative expression.

4.2.7 Framing Nature to Redefine Beauty

Designers possess the power to define natural beauty by framing it in a way that stimulates the human intellect. In this way, designers can utilize techniques to frame and focus attention on landscapes as they occur in their natural state, even those that may ordinarily be ignored or underappreciated, so as to define their inherent beauty for the inhabitant. It is easy for many to recognize the established beauty of dramatic natural occurrences such as a roaring waterfall or vibrant rose, but perhaps less evident is the subtle beauty of commonplace, muted or austere vistas. Yet every locale has a natural beauty if looked at in an appreciative light. Framing these views can allow the intellect to see and understand the inherent beauty in natural elements that don't have the established cultural appreciation. In this way, architecture can be utilized as a mechanism to outline new definitions of natural beauty that will also help to preserve and promote naturally occurring environments and reduce the desire for overly manufactured and unsustainable landscapes.

4.3 Case Studies

What these seven themes of a landscaped architecture bring to light are the principles behind which natural elements may create significance within the built environment. However, the applications are only truly successful when more than one is utilized. The most fulfilling architecture is that which responds to the three needs of function, form, and meaning. To create truly inspired landscaped architecture, all three needs must be fulfilled with a blending of design strategies. Just as nature is full of complex and interwoven relationships, so too should architecture strive for a balance of beneficial interactions. To more fully explore this idea, case studies of contemporary landscaped architecture will be analyzed to see what ways they successfully utilized multiple landscaped architecture design strategies.

4.3.1 CASE STUDY : ACROS Fukuoka

The large green roof on the ACROS Fukuoka Prefecture International Hall in Fukuoka, Japan is an extensive example of a successful integration of natural elements with the built form. Built in a prime location next to the only park in the busy and dense financial center of Fukuoka, architects Emilio Ambasz & Associates wanted to reconcile the need for an elite urban building with the desire for increased urban green space.[175] They were able to achieve this in their design by creating one story terraced gardens rising up the south side of the building, bringing the existing park space vertically upward step by step, culminating in a belvedere overlooking the city's harbor.[176]

The project is a success on multiple levels. Functionally speaking, the project presents many advantages. The site was the only remaining undeveloped location in the busy financial district of Fukuoka, a city not known for its green space. The planned

[175] "ACROS Fukuoka Prefectural International Hall" *Architecture News Plus, Architecture & Design Resource*. http://www.architecturenewsplus.com/projects/706 (accessed October 26, 2011)
[176] Chris van Uffelen. *Façade Greenery: Contemporary Landscaping*. (Germany, Braun Publishing AG, 2011), 41.

development of the lot was problematic for the fact that it would take up the last remaining empty lot in the center of the city, especially significant considering its proximity to the only park in the region. The terraced garden design was able to successfully integrate an elegant new building design while contributing to the city's open green space.[177] A google earth aerial view of Fukuoka's financial district presents striking imagery for the significant amount of green space this design contributed to the city center. It almost doubles the existing park space.

The maintainence of green space in a dense urban core is vital for many reasons. It can be a critical pocket of habitat for local or migrating animals, it can help to alleviate air pollution, and creates a vital opportunity for the city inhabitants to have access to natural elements. Perhaps most significant is the effect of the massive green roof on the urban heat island effect. A research project was undertaken through the joint effort of the Takenaka Corporation, Kyushu University and Nippon Institute of Technology in 2000 to measure the thermal environment of the green roof in comparison to surrounding concrete surfaces in order to assess the degree to which the green roof effects the urban heat island phenomenon.[178] Charts from the study show the drastic difference in the temperature of the green roof compared to the concrete. Ultimately, "the study found the following: a difference of *15°C between the surface temperatures of the concrete*, coming to the obvious conclusion that the greenery and greening suppresses a rise in the surrounding air temperature."[179] In a city center with expansive fields of concrete surfaces, the ACROS Fukuoka Hall stands out as a refreshing relief.

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[177] Linda Velazquez. "GPW: ACROS Fukuoka Prefectural International Hall" *Green Roofs*. http://www.greenroofs.com/blog/2011/08/12/gpw-acros-fukuoka-prefectural-international-hall/ (accessed December 3, 2011).
[178] Linda Velazquez. "GPW: ACROS Fukuoka Prefectural International Hall" *Green Roofs*. http://www.greenroofs.com/blog/2011/08/12/gpw-acros-fukuoka-prefectural-international-hall/ (accessed December 3, 2011).
[179] Linda Velazquez. "GPW: ACROS Fukuoka Prefectural International Hall" *Green Roofs*. http://www.greenroofs.com/blog/2011/08/12/gpw-acros-fukuoka-prefectural-international-hall/ (accessed December 3, 2011).

The extensive green roof also creates functional attributes for the utility of the building. The planted beds, ranging in depth from 12" to 24",[180] create a significant insulation value, drastically reducing energy demands for space conditioning. Simultaneously, it helps to control storm water for the site, soaking up and using much of the rain that falls in the planted beds, and allowing for a collection and redirection of excess water.

The aesthetics of the ACROS Fukuoka Hall are perhaps even more significant than its functional advantages. The inclusion of an extensive green roof on the most prominent example of contemporary construction in the most valued region of the city, is a strong visual statement for the future of architecture in Fukuoka. It is a display of environmentalist ambitions in a highly trafficked and highly regarded location. It creates a showpiece, and a challenge for future design projects in the region.

The project is also a global example, carrying the message of the architect - Emilio Ambasz's theory of "Green over the Gray," a design intent to incorporate "landscape over the building . . .[through] the inventive use of natural processes to achieve functional and economic performance goals and the experiential richness of the natural environment."[181] Emilio Ambasz is successfully integrating both the utility of a green roof, providing energy saving insulation value, and the sensory stimulation of an architectural journey through his use of the natural elements for their "poetic potential."[182] Ambasz is highly sensitive to the emotional appeal that nature can create with its application as an ornamental additon to the building. "My notion is I have to create images that move the heart. If you don't move the heart, what is the point of

[180] Linda Velazquez. "GPW: ACROS Fukuoka Prefectural International Hall" *Green Roofs*. http://www.greenroofs.com/blog/2011/08/12/gpw-acros-fukuoka-prefectural-international-hall/ (accessed December 3, 2011).
[181] Emilio Ambasz & Associates. Firm History. http://www.emilioambaszandassociates.com/information/ (accessed November 9, 2011).
[182] Emilio Ambasz & Associates. Firm History. http://www.emilioambaszandassociates.com/information/ (accessed November 9, 2011).

building?"[183] The ACROS Fukuoka Prefecture Hall certainly achieves this level of aesthetic expression, providing a leading example of what contemporary architecture can aspire to – sustainability and beauty.

[183] Vernon Mays. "The Elusive Mr. Ambasz" *Architect: The Magazine of the American Institute of Architects*. June 2009. http://www.architectmagazine.com/design/past-master-architect-emilio-ambasz.aspx (accessed December 2, 2011).

CASE STUDY 1

green roof | ACROS FUKUOKA

Fukuoka, Japan
by Emilio Ambasz & Associates

Image Source: http://www.architecturenewsplus.com/project-images/6640

Image Source: http://www.architecturenewsplus.com/projects/706

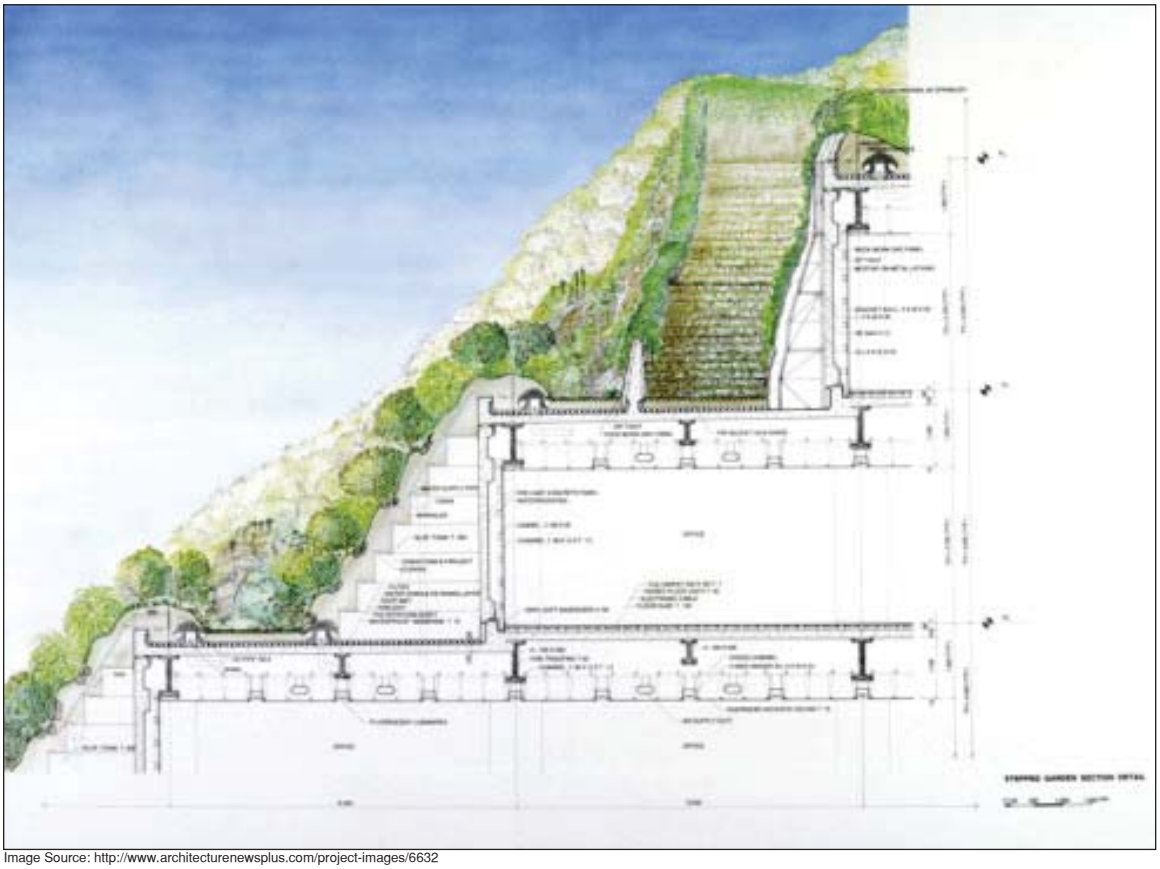
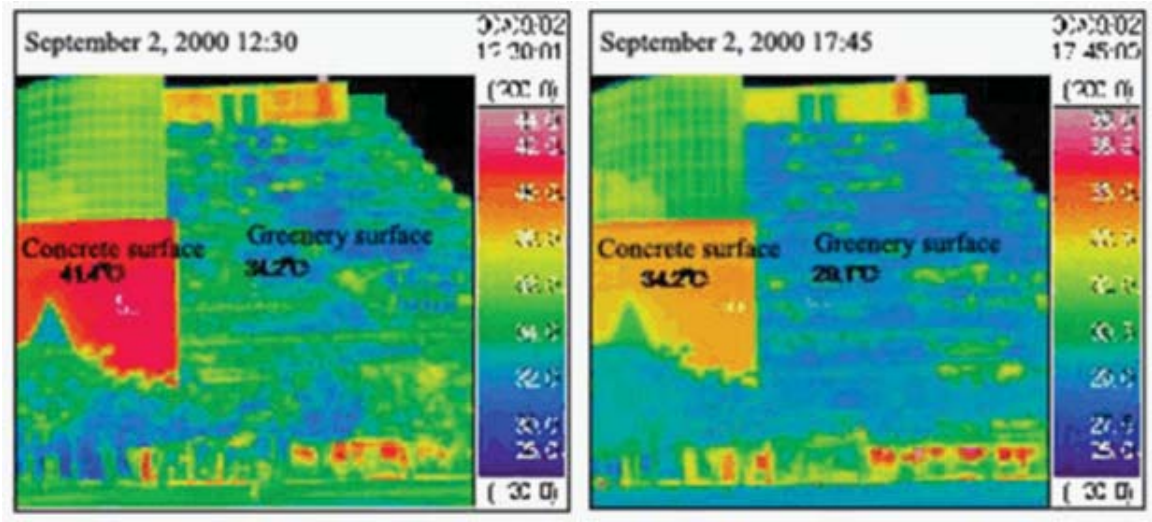


Image Source: http://www.architecturenewsplus.com/project-images/6632

Image Source: http://www.greenroofs.com/blog/2011/08/12/gpw-acros-fukuoka-prefectural-international-hall/

Image Source: http://www.greenroofs.com/blog/2011/08/12/gpw-acros-fukuoka-prefectural-international-hall/



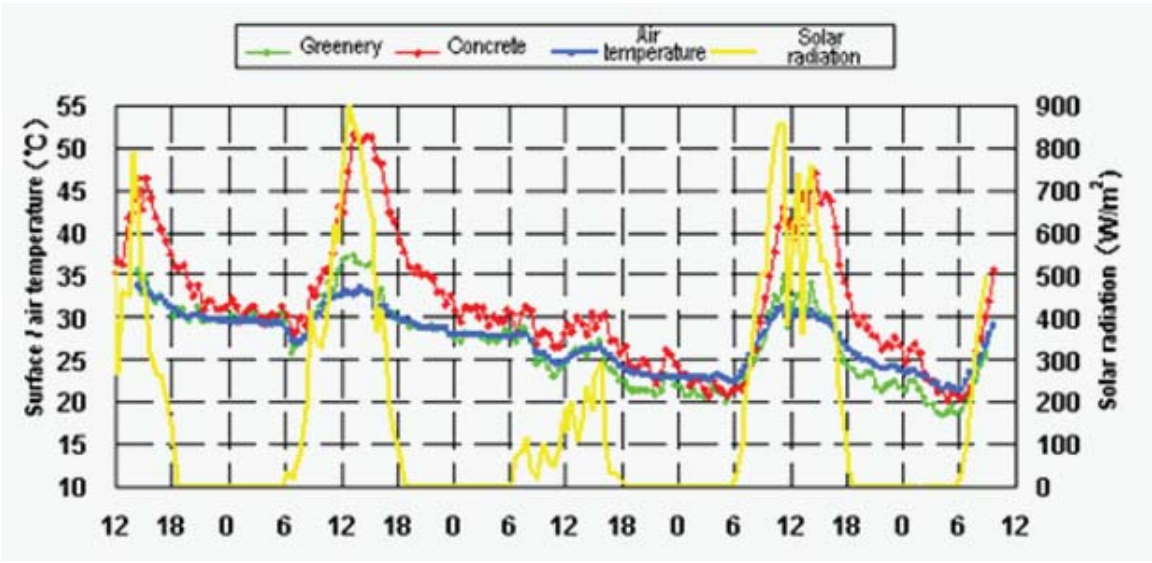


Image Source: http://www.greenroofs.com/blog/2011/08/12/gpw-acros-fukuoka-prefectural-international-hall/

4.3.2 CASE STUDY : Olympic Sculpture Park

The Olympic Sculpture Park in Seattle, Washington is an interesting showcase of the stratum idea, redefining the ground plane through the rise and fall of constructed landscapes. The project was developed on a site with many challenges existing on the original ground plane. Looking directly onto the coastline of Elliott Bay, the steeply sloping urban hillside debouched onto a railway and heavily driven roadway that separated the city from the waterfront. The site, previously occupied by an oil and gas company, presented no living natural environment and soil in great need of remediation.[184] The design solution called for the creation of an elevated ground plane, zigzagging across the existing topography and spanning across the existing vehicular throughways to redefine the city's connection to its waterfront.

The built reality of the park is a nine acre public park, one of the only green spaces in downtown Seattle, and a striking statement for contemporary design. It allows for a reintegration of natural environments into the urban fabric, weaving in and around the existing necessities of Seattle's urban core, while allowing for the reestablishment of vibrant natural environments. The park is designed with restorative environmental strategies including the integration of a salmon habitat, the capture and use of water catchment systems, and the extensive use of native plantings.[185] It simultaneously hosts space for public community activities, creating a blend of human and natural environments that both increase natural habitat and encourage a continual engagement of city dweller with nature. The success of the Olympic Sculpture Park showcases many of the themes that progress the significance of a modern landscaped architecture.

First, the unique strategy for integrating the gardens within the urban fabric serves as an interesting frame for natural beauty. In fact, multiple strategies are used

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[184] Liat Margolis and Alexander Robinson. *Living Systems: Innovative Materials and Technologies for Landscape Architecture*. (Basel: Birkhäuser GmbH, 2010), 38.
[185] "A New Green Space for Art." SAM Olympic Sculpture Park, Map and Guide. http://www.seattleartmuseum.org/visit/pdf/OSPMapandGuide.pdf (Accessed October 31, 2011).

throughout the park to create individual moments that focus attention onto the inherent beauty of Seattle's natural assets. Woven between sculpture installations, the landscape design includes several areas that recreate archetypal landscapes from the Pacific Northwest.[186] Created to mimic the natural plant communities of the region, the Olympic Sculpture Park creates pockets of habitat that focus attention onto the unique beauty and makeup of each ecological setting, artfully framing them using the man-made architecture of the rising and falling ground plane, pathways, and sculptural installations.

This strategy also articulates the theme of education as aesthetic. An exhibit at the park entitled 'Neukom Vivarium' by sculptor Mark Dion features a sixty-foot long fallen Western Hemlock tree, with all of the attending elements that would naturally occur to such a tree in the forest.[187] It is an educational exhibit of what is called a 'nurse log,' a fallen tree which creates an ecosystem around its decaying remains.[188] The exhibit is a living representation of the complex systems of relationships, cycles of death and renewal, and variants of living potential within a forest ecosystem. Included are detailed descriptions of the many varieties of flora and fauna potentially present, microscopes and magnifying glasses, and vintage pieces of scientific equipment in an artistically arranged 'curiosity cabinet'. The tree itself showcases a piece of what was once occurring on the urban sight where it lays, a piece of environmental historicism, designed for viewing through a modern cultural lens of human objects, technology and architecture.[189]

The complexity of the actual construction and maintenance simultaneously emphasizes the magnitude of what is gained from nature, which is taken for granted in

[186] "A New Green Space for Art." SAM Olympic Sculpture Park, Map and Guide. http://www.seattleartmuseum.org/visit/pdf/OSPMapandGuide.pdf (Accessed October 31, 2011).
[187] "Neukom Vivarium." Interview with Mark Dion. PBS, ART:21 http://www.art21.org/texts/mark-dion/interview-mark-dion-neukom-vivarium (accessed October 31, 2011).
[188] Exhibits: Olympic Sculpture Park, Seattle Art Museum, 10. http://www.seattleartmuseum.org/exhibit/exhibitDetail.asp?eventID=10202 (Accessed October 26, 2011).
[189] "Neukom Vivarium." Interview with Mark Dion. PBS, ART:21. http://www.art21.org/texts/mark-dion/interview-mark-dion-neukom-vivarium (accessed October 31, 2011).

day-to-day life. The sculptor himself describes the exhibit as somewhat of an "abomination," because of the complexity of the mechanical systems necessary to sustain it.

> We're taking a tree that is an ecosystem – a dead tree, but a living system – and we're re-contextualizing it and taking it to another site. We're putting it in a sort of Sleeping Beauty coffin, a greenhouse we're building around it. And we're pumping it up with a life support system – an incredibly complex system of air, humidity, water, and soil enhancement – to keep it going. All these things are substituting what nature does – emphasizing how, once that's gone, it incredibly difficult, expensive, and technological to approximate that system . . . It shows that, despite out technology and money, when we destroy a natural system it's virtually impossible to get it back.[190]

What Dion achieves in 'Neukom Vivarium' is education as aesthetic, in which environmental issues are brought to the forefront of consciousness through artful experience-making. The entire piece, part work of art, part architecture, part horticultural and environmental education, creates a sensory experience in which one learns through inhabiting – smelling, touching, seeing – the awareness of the spectacular beauty and complexity of nature brought to the consciousness by purposeful aesthetic intent.

Ultimately, the Olympic Sculpture Park is a vibrant example of many of the themes, taking the many contemporary forms of landscaped architectural expression into a journey of nature and man, woven and interdependent.

[190] "Neukom Vivarium." Interview with Mark Dion. PBS, ART:21. http://www.art21.org/texts/mark-dion/interview-mark-dion-neukom-vivarium (accessed October 31, 2011).

CASE STUDY 2

stratum | OLYMPIC SCULPTURE PARK

Seattle, Washington
by Weiss / Manfredi Architects

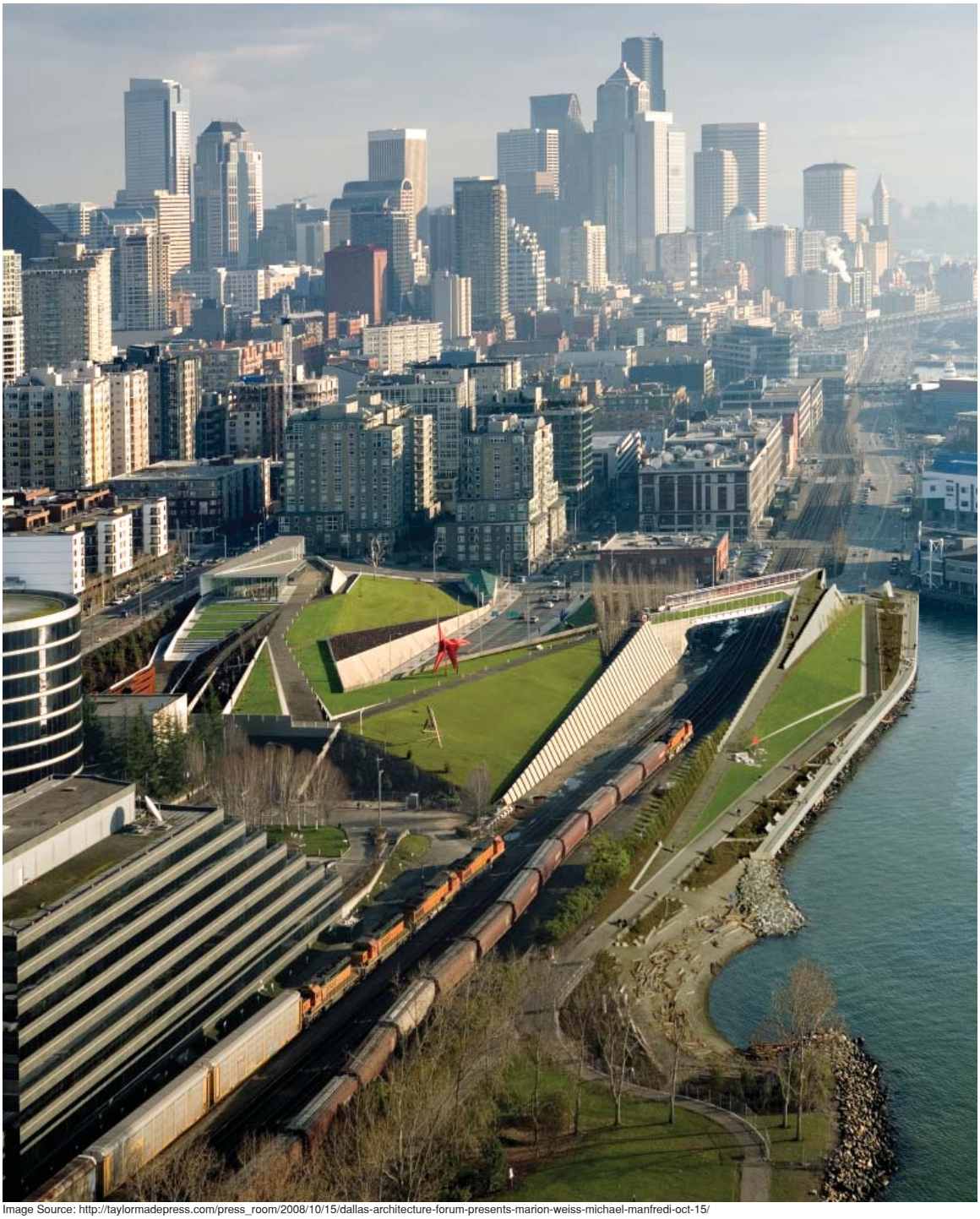

Image Source: http://taylormadepress.com/press_room/2008/10/15/dallas-architecture-forum-presents-marion-weiss-michael-manfredi-oct-15/

Image Source: http://www.chi-athenaeum.org/archawards/2008/olumpicsculpturepark.html

NEUKOM VIVARIUM

by Mark Dion

Image Source: http://theparsley.wordpress.com/tag/ecoliteracy/

4.3.3 CASE STUDY : Sidwell Friends

An excellent incorporation of built and natural elements has been constructed at Sidwell Friends School in Washington D.C. The new building at Sidwell's Middle School is arranged around a courtyard of cascading wetland gardens that serve as both an aesthetic showcase as well as an integral component to the water systems for the building. Begun as a combination renovation and addition, the design of the building evolved into an educational change towards sustainability and a statement of values for the school. "We started out designing a building, which turned into a green building, and that green building ended up transforming the whole school, culturally and operationally."[191] The design intent originated from the site, located along two ecologically significant watersheds,[192] continually evolving into an inspiring aesthetic design that fully incorporates ecological design strategies.

The roof of the building is a green roof, with a garden where students grow food for the cafeteria that simultaneously provides water catchment. It is integrated in with the storm water management system, which in turn is linked with the black water treatment system, all leading to the focal point of the wetland courtyard at the entrance to the building.[193] The constructed wetlands in the courtyard not only collect the water, but purify it, finishing an entire cycle of a building's water system right on site. Unlike ordinary water systems, that separate each water function and transport waste to outside facilities for processing, the constructed wetlands at Sidwell fully incorporate all water management into a cohesive and local system based on a self-sustaining ecological environment.

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[191] Nadav Malin. "Sidwell Friends Middle School: Academic Achievement: A School Expansion in our Nation's Capitol Introduces a Wetland to a Dense Urban Site." *Green Source: The Magazine of Sustainable Design*. http://greensource.construction.com/projects/0707_sidwell.asp (accessed November 9, 2011).
[192] Nadav Malin. "Sidwell Friends Middle School: Academic Achievement: A School Expansion in our Nation's Capitol Introduces a Wetland to a Dense Urban Site." *Green Source: The Magazine of Sustainable Design*. http://greensource.construction.com/projects/0707_sidwell.asp (accessed November 9, 2011).
[193] "The Wetland Machine of Sidwell." Pruned: On Architecture and Related Field, blog. http://pruned.blogspot.com/2009/06/wetland-machine-of-sidwell.html (accessed October 26, 2011).

It has also been successful not only functionally, but also for the way it has used aesthetics for both educational value and for creating transparency as awareness. The project landscape architect, José Alminana of Andropogon, describes the way in which the building acts as an educational tool through a holistic integration of natural elements that engages the students and faculty with the systems, bringing a consciousness and awareness to the processes that support them. "The place is the process."[194] It is a "'working landscape'… [or] an 'event landscape,' wherein natural processes are co-opted into a cybernetic amalgam of landscape, architecture, geology, biology and institutional pedagogy."[195] Ultimately, the constructed wetlands at Sidwell Friends are significant because they enforce the notion of a new and integrated environmental aesthetic that combines function, form and significance. They function ecologically speaking, they are a valuable aesthetic attribute to the building environment, and they encourage the educational culture of a school through an increased awareness and engagement between the students and natural systems.

[194] Nadav Malin. "Sidwell Friends Middle School: Academic Achievement: A School Expansion in our Nation's Capitol Introduces a Wetland to a Dense Urban Site." *Green Source: The Magazine of Sustainable Design*. http://greensource.construction.com/projects/0707_sidwell.asp (accessed November 9, 2011).
[195] "The Wetland Machine of Sidwell." Pruned: On Architecture and Related Field, blog. http://pruned.blogspot.com/2009/06/wetland-machine-of-sidwell.html (accessed October 26, 2011).

CASE STUDY 3

water | SIDWELL FRIENDS

Washington D.C.
by Andropogon Associates, Kieran Timberlake Associates

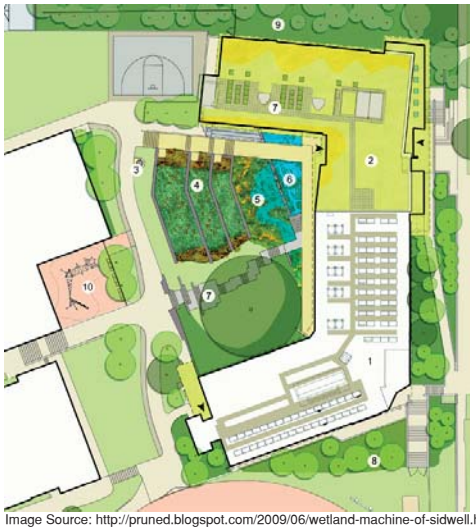
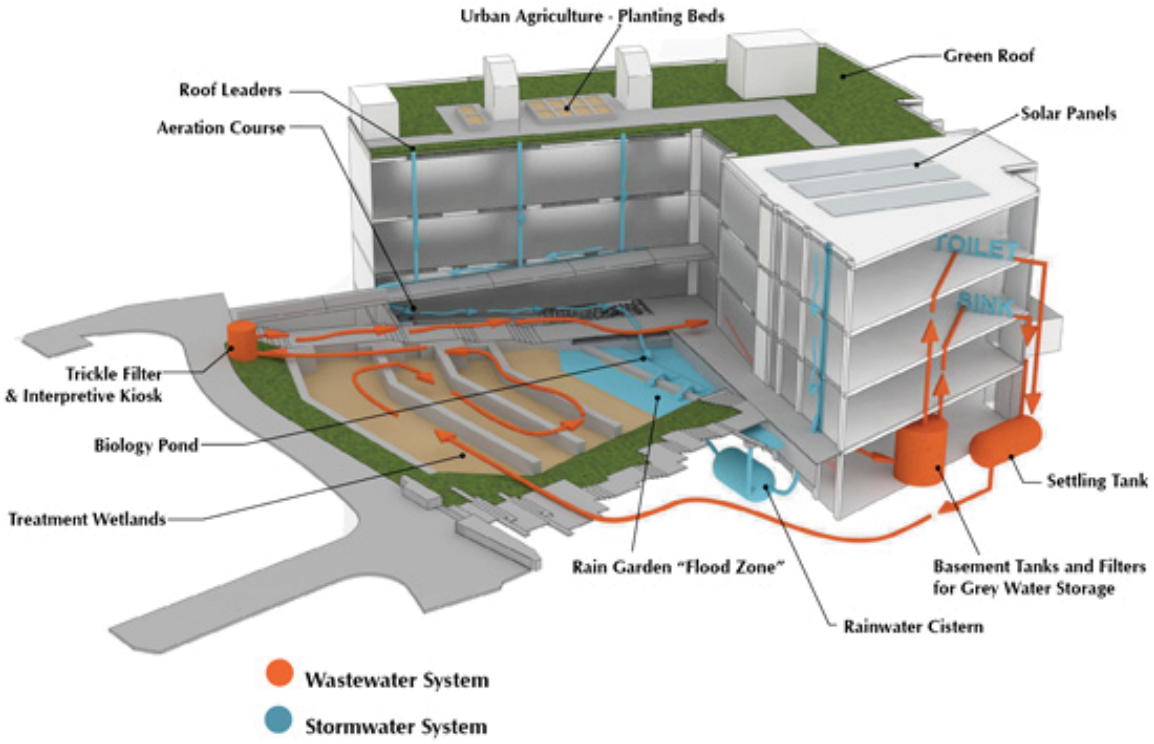
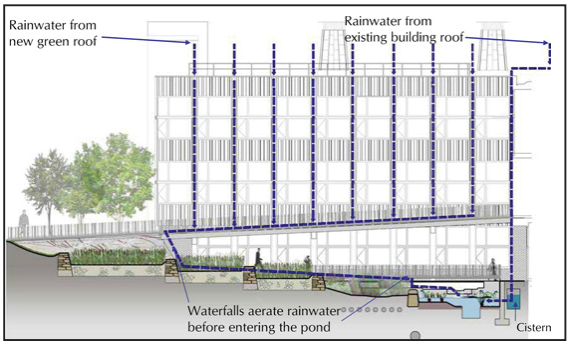


Image Source: http://pruned.blogspot.com/2009/06/wetland-machine-of-sidwell.html





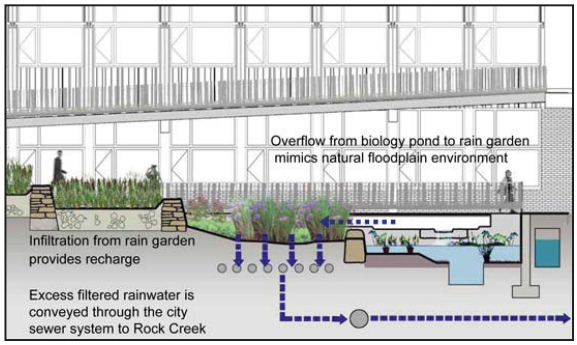


Image Source: http://pruned.blogspot.com/2009/06/wetland-machine-of-sidwell.html

Summary

Projects such as those chosen for case studies present promising examples for the potential of a landscaped architecture. However, the question still remains if these various ways to increase the engagement of human and natural environments will create meaningful design in the years to come. The most contemporary usages of landscape within architecture are visually intriguing, certainly, but it remains to be seen if any of these trends will have lasting influence on the built environment. Likely, elements will be catalogued as vocabulary specific to a time and place, but there is the potential in much of the landscaped architecture innovations to create attractive ways in which to incorporate environmentally sustainable tactics into the built environment. Not only do they have the potential to integrate ecological strategies from a functional standpoint, they are perhaps more important in the potential they have to restructure cultural awareness of environment. Uses of artistic, aesthetic, or transparent methods of integrating the natural environmental within the built environment helps to focus attention, instigate awareness, and ultimately produce a participatory sense of ownership and responsibility. It is the expression of these underlying principles that will propel a burgeoning ecological design era.

CHAPTER 5 : DESIGN EXPLORATION

As we have seen, the contemporary sustainability movement has instigated a trend within architecture to increasingly use landscaping within, on, and around every element of the built environment in a sort of 'landscaped architecture'. It seems we are in a moment in architectural history where the need for a more sustainable architectural practice is being manifested in ever more creative ways to incorporate living greenery as architecture, in a literal 'greening' of the building. It remains to be seen if this trend within architecture is only that – a trend – or whether these explorations of landscape's unification with architecture will have a more lasting significance. What long term benefits can be found through the increased integration of landscaping within architecture that will continue to be utilized once it is no longer a fashionable statement for contemporary architects?

In the previous chapter, seven design guidelines outlined the potential uses of a 'landscaped architecture': Transparency Equals Awareness, Architecture as a Journey, Retreat, Utility, Boundary, Education as Aesthetic, and Framing Nature to Redefine Beauty. Each of these identifies a theoretical use for landscape's integration with the built environment. To showcase the ways in which a contemporary 'landscaped architecture' can and does address these critical points, a design exploration will be undertaken. The test location is located in the town of Waimānalo on the island of Oahu in Hawai`i.

5.1 Waimānalo : Site Background

Waimānalo is located on the southeastern portion of Oahu, in the Ko`olaupoko region on the windward side of the Ko`olau Mountain Range. (See Figures 3 and 4) It is a small country town, with a long tradition of agriculture and relaxed island living within an idyllic natural setting. The story of this community is, in many ways, a common story in Hawai`i. It is a place that has gone through many changes as different people and ways of life have occupied the land, from the ancient Hawaiians through colonialization and now into the 21st century. It is a community that is trying to redefine itself in the modern world with a full sense of local pride and desire to reaffirm its roots. One common thread throughout its many variations is that Waimānalo has always been a region with an intimate relationship with the land – agriculturally, aesthetically and culturally – and thus creates an interesting setting for the design exploration of landscape's relationship to architecture.

Waimānalo has a population of approximately 5,451 people,[196] known as one of the few remaining agricultural communities on the island of Oahu - the most populated island in Hawai`i. Waimānalo, like many other pastoral communities near urban centers, is in danger of losing its rural character to development. According to the development plans of the Honolulu County Department of Planning and Permitting (DPP), future growth is to be concentrated only in the urban cores, with minimal development in the remaining community areas. Figure 5 shows a map of the slated development for Oahu. As can be seen, Waimānalo is designated to remain rural. To help guide this development plan, the DPP instituted a 'Ko`olaupoko Sustainable Communities Plan' for the region in 2000 as a way to help maintain the rural character of the area and to deter inappropriate development. Despite this, the population within the Waimānalo region grew rapidly from 2000 to the present. The island of Oahu grew in population by 8.8% from 2000 to 2010,[197] while Waimānalo grew by 48.8%.[198] With

[196] United States Census, 2010. http://2010.census.gov/2010census/ (Accessed May 6, 2012).
[197] U.S. Department of Commerce, United States Census Bureau. Honolulu County, Hawaii. http://quickfacts.census.gov/qfd/states/15/15003.html (Accessed May 6, 2012).

this kind of population increase, development is inevitable to accommodate the needs of a growing community.

The county development agenda presents a good overarching plan for the area, but it does not direct the actual shape of growth. Even as they state in the Ko`olaupoko Sustainable community plan, the plans "are not regulatory. Rather, they are established with the explicit intent of providing a coherent vision to guide all new public and private sector development within Ko`olaupoko."[199] From a legal perspective this is helpful because it creates a framework for directing land use policy. As is stated, "public improvement projects and subdivision and zoning ordinances shall be consistent with and carry out the purposes of the development plan for that area. Although the Development Plans or Sustainable Communities Plans are not themselves regulatory, they 'regulate the regulators.'"[200] However, this does not explicitly direct the design and implementation of growth that does fit within this larger vision. It becomes the role of the architect to interpret the built reality of these development visions, working within the needs of population growth. It represents an interesting design challenge – how to maintain the rural character and unique identity of a small agricultural community as it develops. The relationship of landscape and architecture is particularly pertinent in this circumstance.

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[198] U.S. Department of Commerce, United States Census Bureau. Waimanalo CDP, Hawaii. http://quickfacts.census.gov/qfd/states/15/1578050.html (Accessed May 6, 2012).
[199] Department of Planning and Permitting, City and County of Honolulu, *Koolaupoko Sustainable Communities Plan*. (Honolulu, August 2000), Sec. 24-6.2 c.
[200] Department of Planning and Permitting, City and County of Honolulu, *Koolaupoko Sustainable Communities Plan*. (Honolulu, August 2000), Sec. P.2, ii.

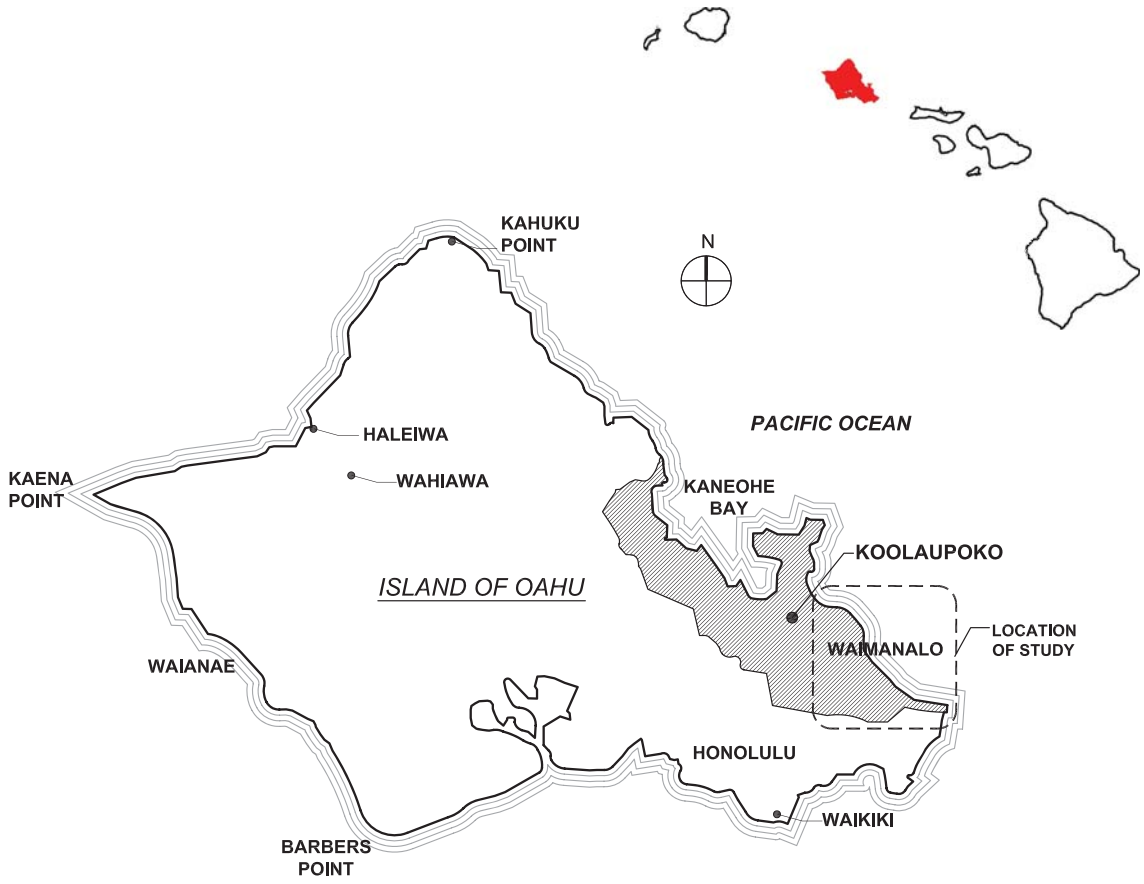


FIGURE 3 :: OAHU ISLAND MAP

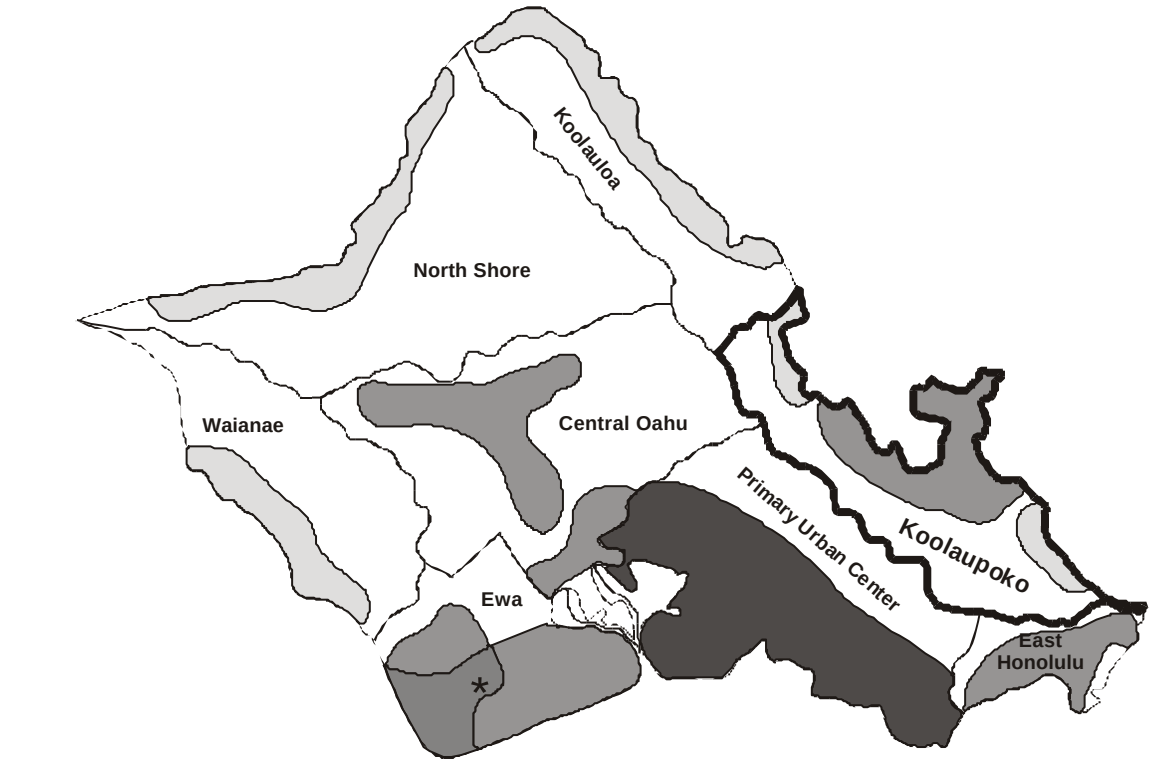
Image Source: Fung Associates. Waimānalo Community Business Center: Site Selection Study and Conceptual Planning. Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008.

FIGURE 4 :: AHUPUA`A OF KO`OLAUPOKO

Image Source: "Hawaiian Place Names," Hawaiian Studies Institute, KSBE. http://kanakagenealogy.wordpress.com/maps/islands/oahu/oahu-island-ahupuaas/koolaupoko-ahupuaa-oahu-island/highlighting_Honolulu_County.svg

FIGURE 5 :: DEVELOPMENT MAP OF OAHU

Image Source: Department of Planning and Permitting, City and County of Honolulu, Koolaupoko Sustainable Communities Plan. Honolulu: August 2000.



Primary Urban Center

* Secondary Urban Center

Urban-Fringe

Rural

5.1.1 Waimānalo : Ecology

The Waimānalo valley is approximately 12 square miles, bordered on all sides by natural features. See Figure 7 for a topographical map of the region. The back of the valley is enclosed by the dramatic Ko`olau Mountain Range that rises rapidly to approximately 2,200 feet at its highest peak, Pu`u O Kona[201] (Figure 6). The edges of the valleys are bordered by the pali of the Ko`olau Mountains on one side and on the other side by the Aniani Nui ridge line ending in the other recognizable local peak, Mt Olomana (Figure 8). The front of the valley features a series of beautiful beaches and the awesome presence of the Pacific Ocean (Figures 9 and 10).

Much like other areas in the Hawaiian Islands, the climate ranges in the valley from the shoreline to the mountains. The air becomes cooler and the average rainfall becomes higher as one progresses deeper into the valley. The coastal regions receive approximately 40 inches of rain per year, while the mountainous areas receive around 100 inches per year.[202] On average, the valley has a temperature of approximately 75.2^{o}F,[203] with the typical Hawaiian wind patterns of primarily trade winds from the Northeast and occasional Kona winds from the South.

Water within the valley is provided by both natural streams and man-made irrigation strategies. Three major streams run through the valley: one perennial, the Waimānalo Stream (Figure 12), and two intermittent, Inoaole Stream and Muliwaiolena Stream.[204] See Figure 11 for a map of the valley's waterways. While none of Waimānalo's streams hold the federal management designation of wild, scenic, or recreational rivers, the "Waimānalo Stream is assigned Ecology Quality Status II (of

[201] Department of Land and Natural Resources, Division of Water and Land Development, Windward Oahu Soil and Water Conservation District, and United States Department of Agriculture, *Waimanalo Watershed, City and County of Honolulu: Final Watershed Plan and Environmental Impact Statement*. (Honolulu: 1981), 7.
[202] Fung Associates, *Waimānalo Community Business Center: Site Selection Study and Conceptual Planning*. (Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008), 2-4.
[203] Ibid.
[204] Ibid.

moderate to high quality) as a fish habitat."[205] There are also many man-made ditches and two man-made reservoirs in the valley, the Kailua and Maunawili reservoirs. These were put in to accommodate the irrigation needs of the valley's agriculture. During years when irrigation needs were highest, water also came from the Maunawili Valley Springs and tunnels, Kawainui Marsh and the Waimanalo Lagoon.[206] These man-made irrigation systems now pose risks to the valley due to uncontrolled run-off in times of heavy rain that cause flooding, erosion, and pollution.[207]

There are large tracts of protected habitat area within the Waimānalo region. The largest is the Waimānalo Forest Reserve, protecting approximately 1,413 acres along the slopes of the Ko`olau Mountains.[208] There are also some significant wetland areas in Waimānalo, mostly within the area now occupied by the Bellows Air Force Base. These wetlands are important habitat for wildlife and also act as essential reservoirs for water run-off. See Figure 13 for a map of these protected regions.

[205] Department of Land and Natural Resources, Division of Water and Land Development, Windward Oahu Soil and Water Conservation District, and United States Department of Agriculture, *Waimanalo Watershed, City and County of Honolulu: Final Watershed Plan and Environmental Impact Statement*. (Honolulu: 1981), 7.
[206] Ibid, 9.
[207] Fung Associates, *Waimānalo Community Business Center: Site Selection Study and Conceptual Planning*. (Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008), 2-4.
[208] Department of Hawaiian Homelands and the Waimanalo Advisory Committee. *Land-Use Recommendation of Waimanalo Beach and Forest Reserve Lands: Final Report*. (Honolulu: 1985), 1.

FIGURE 6 :: KO`OLAU MOUNTAINS AND PU`U O KONA

Image Source: http://www.city-data.com/picfilesc/picc7660.php

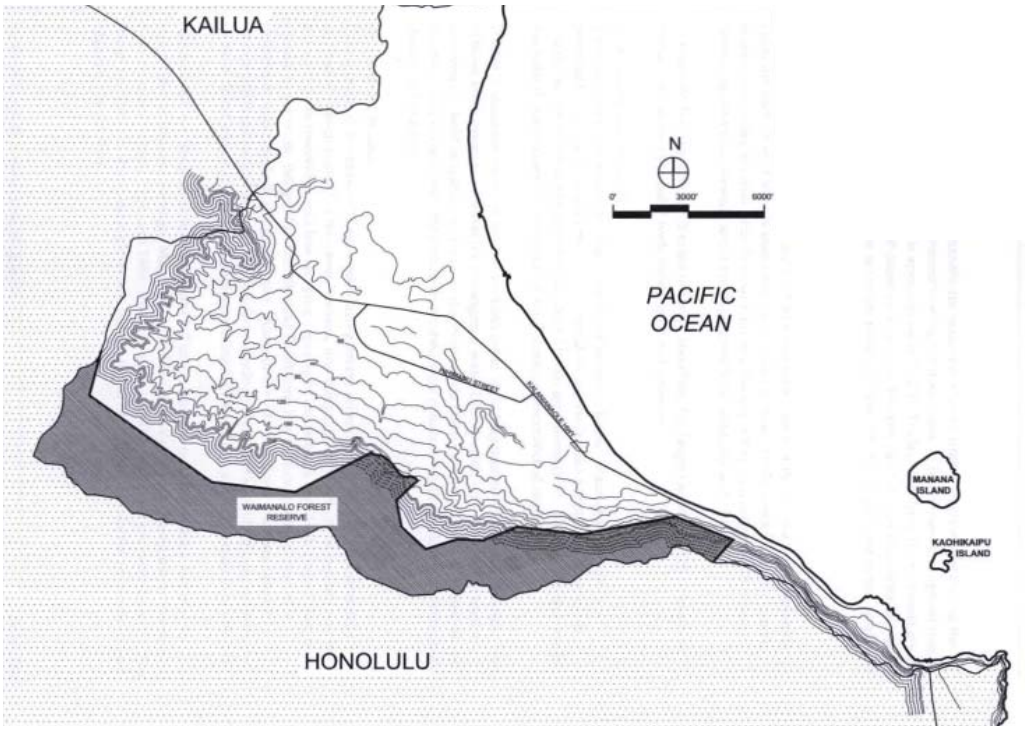


FIGURE 7 :: WAIMĀNALO TOPOGRAPHICAL MAP

Image Source: Fung Associates. Waimānalo Community Business Center: Site Selection Study and Conceptual Planning. Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008.

FIGURE 8 :: MOUNT OLOMANA

Image Source:http://www.hotspotshawaii.com/irhpages/mountains2/olomana3.jpg

FIGURE 9 :: MAKAPU`U BEACH

Image Source:http://www.to-hawaii.com/oahu/beaches/makapuubeachpark.php

FIGURE 10 :: WAIMĀNALO BEACH

Image Source:http://www.tripadvisor.com/LocationPhotos-g60662-Waimanalo_Oahu_Hawaii.html

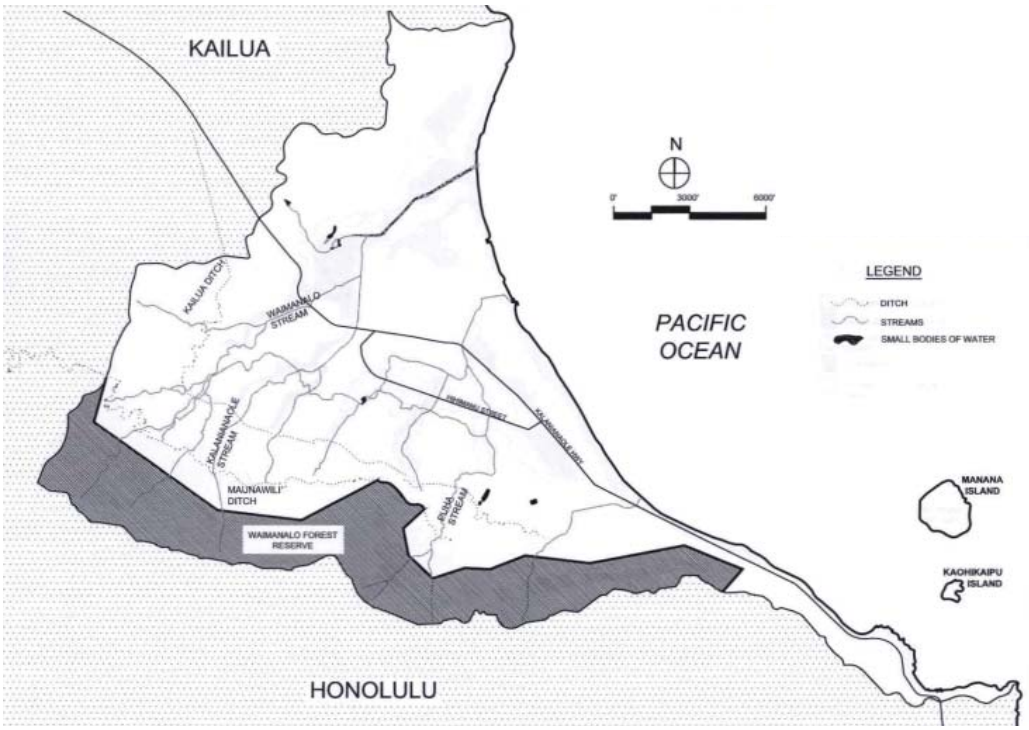


FIGURE 11 :: MAP OF WATERWAYS

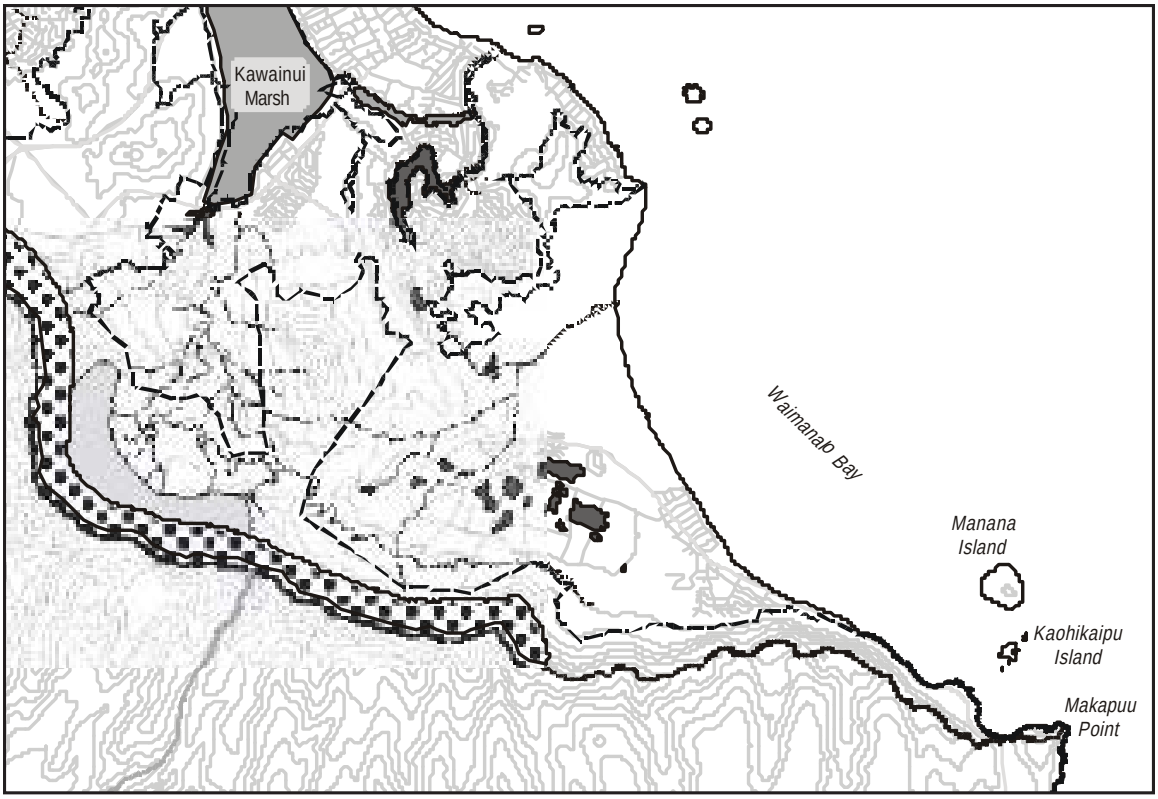
Image Source: Fung Associates. Waimānalo Community Business Center: Site Selection Study and Conceptual Planning. Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008.

FIGURE 12 :: WAIMĀNALO STREAM

Image Source: http://the.honoluluadvertiser.com/article/2001/Jul/20/ln/ln24a.html

FIGURE 13 :: WAIMĀNALO WILDLIFE HABITATS

Image Source: Department of Planning and Permitting, City and County of Honolulu, Koolaupoko Sustainable Communities Plan. Honolulu: August 2000.



Perennial Stream

Conservation District Boundary

Recovery Area for Rare and Listed Plants

Known Habitat of Elepaio

Frequent Waterbird Habitat

Other Regulated Wetlands

5.1.2 Waimānalo : Aesthetics

The aesthetics of Waimānalo are dominated by the dramatic natural features of the area as well as the farming culture that has been such a defining aspect of the local community. The mountains create a dramatic background while the coastline provides idyllic beachfront. Between these natural wonders are acres of farmland, ranging from small multi-crop farms (Figure 14), to large scale plant nurseries (Figure 15).

The architecture within the region reflects this basic makeup. The majority of the structures in the region are small, plantation style cottages (Figure 16). Along the beach front, there are examples of modern, high-end residences such as the beach house seen in Figure 17. There is also a large presence of temporary structures, especially at the beach parks. Some tents are set up for entertainment purposes, such as the picnic tent in Figure 18, but Waimanalo Beach Park also serves as a semi-permanent resting place for a homeless population (Figure 19).

Scattered among the primarily agricultural and residential makeup of Waimānalo are a few commercial and community buildings, such as St. George's Church (Figure 20) and local fooderies like Keneke's (Figure 21). There is also a classic Hawai`i landmark, the historic lighthouse on Makapu`u point (Figure 22).

FIGURE 14 :: NALO FARM

Image Source:http://www.hapahale.com/blog/tag/farm-tour

FIGURE 15 :: GREEN FLAMINGO NURSERY

Image Source:http://www.greenflamingonursery.com/JPEG009.jpg

FIGURE 16 :: PLANTATION STYLE COTTAGE

Image Source:http://www.oahure.com/Oahu-Real-Estate/Waimanalo

FIGURE 17 :: BEACH HOUSE

Image Source:http://hawaiiansunrisewaimanalo.blogspot.com/p/hawaiian-sunrise-vacation-home.html

FIGURE 18 :: PICNIC TENT

Image Source:http://vickycollinsonline.com/2011/07/10/facetime-instead-of-facebook-36-hours-in-honolulu/

FIGURE 19 :: HOMELESS

Image Source:http://the.honoluluadvertiser.com/dailypix/2002/Aug/22/ln03a2_b.jpg

FIGURE 20 :: ST GEORGE CHURCH

Image Source:http://custosfidei.blogspot.com/2007/08/st-george-church-in-waimanalo-hawaii.html

FIGURE 21 :: KENEKE'S

Image Source:http://www.flickr.com/photos/nojuanshome/6432157967/sizes/l/in/photostream/

FIGURE 22 :: MAKAPU`U LIGHTHOUSE

Image Source:http://blog.sfgate.com/hawaii/2010/03/22/to-the-lighthouse-makapuu-memories/

5.1.3 Waimānalo : Culture

What greatly unites the community of Waimānalo is its agricultural character and rugged natural beauty. Throughout is recorded history, Waimānalo has been an important agricultural region. Even its name, which means 'potable or sweet water'[209] in Hawaiian, suggests the importance of its fertile potential for the people in the valley.

Before European contact, the Waimānalo region was home to a large population of Hawaiians. Farming communities and fishing villages worked together in a subsistence economy so that Waimānalo "was a heavily populated native settlement that supported hundreds of families in grass houses set among cane fields. Taro, mountain apple, coconut, and breadfruit trees furnished food for the picking."[210] Waimānalo was a living example of the ahupua`a system, where large communities of people thrived by careful resource management and trading the different bounties from mauka to makai. Evidence of this early agricultural society can be seen in the remains of terraced lo`i patches and irrigation ditches (See Figure 23). Other archeological remains exist from this early Hawaiian community. Waimānalo is thought to have had many heiaus at one point. There was also a significant cobbled-lava road that was a major route for travel, crossing the saddle at Makapu'u into Waimānalo, now covered by the Kalanianaole Highway.[211] Only a few of these archaeological sites remain in Waimanalo as reminders of that era.[212] See Figure 24 for a map of the remaining archeological sites within Waimānalo.

The culture within Waimānalo began to change as the ahupua'a model gave way to Western land use patterns. From 1846-1855, the Great Mahele was enacted, dividing

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[209] Fung Associates, *Waimānalo Community Business Center: Site Selection Study and Conceptual Planning*. (Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008), 2-1.
[210] David De Leon, *A Short History of Waimānalo*. (Honolulu, February 28, 1978), 1.
[211] David De Leon, *A Short History of Waimānalo*. (Honolulu, February 28, 1978), 2.
[212] Fung Associates, *Waimānalo Community Business Center: Site Selection Study and Conceptual Planning*. (Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008), Map 2-11.

land and transferring it to private ownership.[213] At this time, most of Waimānalo was reserved as part of the estates set aside for King Kamehameha III.[214] The King then leased the land to Thomas Cummins, for the purposes of ranching.[215] It remained ranch land until the 1870's when Chinese rice farmers settled in the valley and began to use their farming skills to grow sugar cane. Seeing the great potential for this crop, Thomas Cummins started the Waimānalo Sugar Company, which turned out to be so successful that, "Waimanalo became known as the 'sugar mecca' of Hawaii."[216] It wasn't until the mid-1900's that the sugar era ended and the valley returned to diversified farming.[217] It has remained more or less that way since. A map of the current land in Waimānalo deemed 'significant agricultural land' can be seen in Figure 25.

Another significant change for the valley was the appropriation of a portion of land by the federal government for military purposes in 1917, now known as Bellows Air Force Station. Before WWII, the area acted as an annex to the Air Corps field in Wahiawa, but became significantly more active during the war. The area expanded and became as a key location for training US Air Force personnel.[218] Today, the land remains military land, but is no longer an active camp.

All of these developments mean that the cultural makeup of Waimānalo today is diverse, much like the rest of Hawai`i. According to the 2010 census data, the racial makeup of Waimanalo is 23.8% Asian, 23.3% Native Hawaiian/Pacific Islander, 12.3% White, and the remainder split between African American, American Indian and Alaskan Native.[219] The land-use pattern is evidence of this diversity. Figure 26 shows a breakdown of the land-use in Waimānalo, ranging greatly from military, to preservation,

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[213] Gavan Daws, *Shoal of Time: A History of the Hawaiian Islands*. (Honolulu: University Press of Hawaii, 1974), 126.
[214] Dept. of Urban & Regional Planning, *Waimānalo Planning Issues: A Community Based Reconnaissance* (Honolulu: University of Hawaii, 1987).
[215] Ibid.
[216] David De Leon, *A Short History of Waimānalo*. (Honolulu, February 28, 1978), 5.
[217] Dept. of Urban & Regional Planning, *Waimānalo Planning Issues: A Community Based Reconnaissance* (Honolulu: University of Hawaii, 1987).
[218] David De Leon, *A Short History of Waimānalo*. (Honolulu, February 28, 1978), 7.
[219] United States Census, 2010. http://2010.census.gov/2010census/ (Accessed May 6, 2012).

to privately owned, to agricultural, and to state-run land such as Department of Land and Natural Resources lease holds and Department of Hawaiian Homeland residential tracts.

Waimānalo maintains one of the highest percentages of Native Hawaiians on the island,[220] and much of the community culture is defined by a sense of pride in this local character. Waimānalo also holds significant tracts of land set aside for native Hawaiians under the Hawaiian Homeland Act, comprising almost 2,000 acres and housing approximately 4,000 Native Hawaiians.[221]

The history of the Hawaiian people has been a challenging one, due to the colonializing forces that came to Hawai`i and dominated over the traditional culture. A renaissance in Hawaiian culture has been taking place in the islands since the 1960's and can be seen in regions like Waimānalo. An important moment in reasserting Hawaiian identity happened and is happening in Waimānalo. In the early 1990's, a group of Hawaiians, angry with the displacement of natives from the land, began to organize an occupation of Makapu`u Beach. The occupation grew to include 300 people and resulted in the organization of a Hawaiian independence group called the Ohana Council led by Pu`uhonua Kanahele (aka Bumpy), based around the education and organization of native Hawaiians to reassert sovereignty over the land.[222] In 1993, President Clinton passed the US Public Law 103-150, which many saw as a legal admission that US Jurisdiction and governance of Hawai`i is illegal.[223] In a culminating moment of the Makapu`u occupation and the passing of this Law, the Ohana Council declared independence on January 17, 1994, creating the Hawaiian Sovereign Nation, 101 years

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[220] Kamehameha Schools, *Waimānalo Community Data Profile*. (Honolulu: Kamehameha Schools –PASE, 2006), 2.
[221] Department of Hawaiian Homelands. *Waimānalo Regional Plan*. (Kapolei, HI: Department of Hawaiian Homelands, August 2008), 6.
[222] Joseph Udell, "Whatever Happened to Bumpy Kanahele?", *Honolulu Magazine*. (November, 2007). http://www.honolulumagazine.com/Honolulu-Magazine/November-2007/Updates-Whatever-Happened-to-Bumpy-Kanahele/ (Accessed May 6, 2012).
[223] Cogswell and Schiotz, *Navigation in the Information Age: Potential Use of GIS for Sustainability and Self-Determination in Hawai`i*. (1996), http://www.hawaii-nation.org/gis/5-nation.html (Accessed May 6, 2012).

after the overthrown of the Hawaiian Kingdom.[224] The occupation only ended once the state set aside 46 acres of land in Waimānalo for the occupiers to establish as a modern Hawaiian village and headquarters of the Hawaiian Sovereign Nation.[225] This tract of land is now known as Pu`uhonua o Waimānalo. The land has been returned to traditional Hawaiian farming practices and houses approximately 80 people living together as an extended Hawaiian ohana.[226]

The pride in local identity can be seen in other ways as well in the region. There are many active local organizations (for an extensive listing, look at the Waimānalo Community Resource Directory, 2005), all created around the support of community based efforts. There are also an active number of people who are striving to participate in a strong local identity even if they do not have blood ties to the area. As one of the few remaining agricultural communities remaining on the island, it attracts those that desire to live off the land and strive to bring the islands closer to sustainability, whether of Hawaiian heritage or not. Even for those that do not choose to live in Waimānalo, the region still represents the idea of supporting 'local'. In restaurants around the island, Nalo greens, or greens from Waimānalo, are touted as the way to 'eat local'. It is further evidence of the cultural identity of the region - local pride in the rural, agricultural character, and containing the potential to return to a self-sustaining community.

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[224] Ibid.

[225] Joseph Udell, "Whatever Happened to Bumpy Kanahele?", *Honolulu Magazine*. (November, 2007). http://www.honolulumagazine.com/Honolulu-Magazine/November-2007/Updates-Whatever-Happened-to-Bumpy-Kanahele/ (Accessed May 6, 2012).

[226] Pu`uhonoua o Waimānalo. *Hawaiian Cultural Village and Traditional Lo`I Kalo Agricultural Restoration Project*. http://www.hawaii-nation.org/puuhonua.html (Accessed May 6, 2012).

FIGURE 23 :: RESTORED LO`I TERRACES

Image Source:http://www.hawaii-nation.org/puuhonua.html

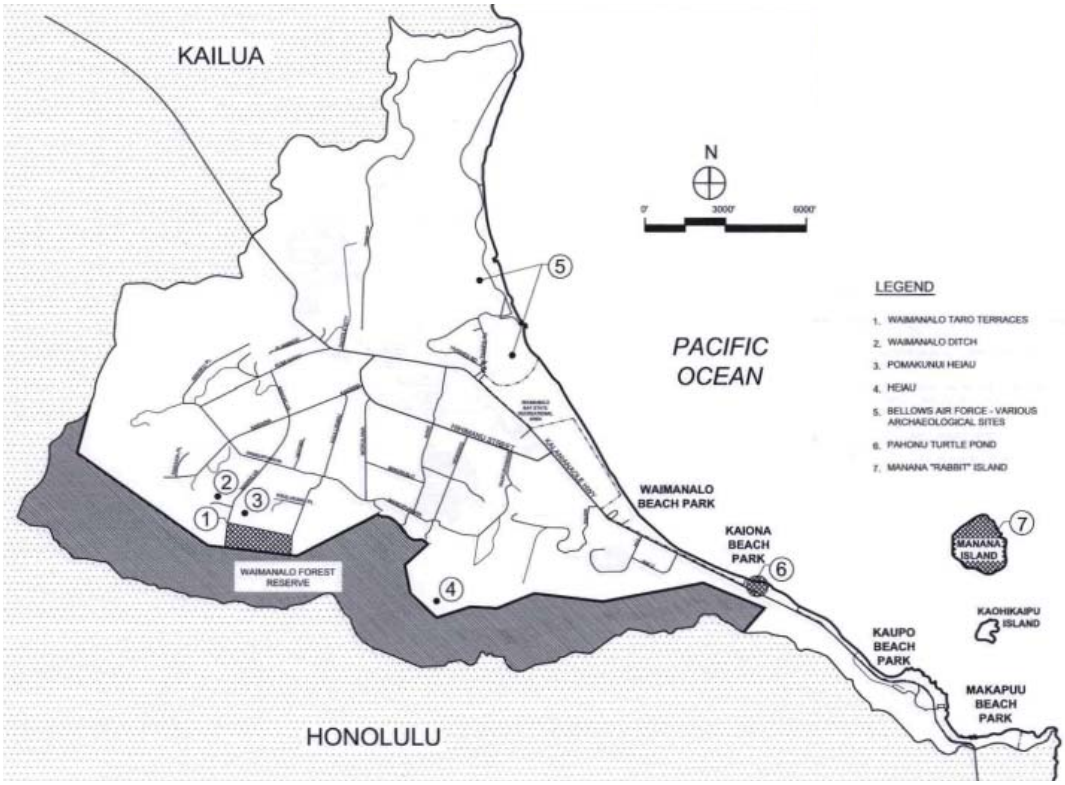


FIGURE 24 :: PLACES OF HISTORIC OR ARCHEOLOGICAL SIGNIFICANCE

Image Source: Fung Associates. Waimānalo Community Business Center: Site Selection Study and Conceptual Planning. Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008.

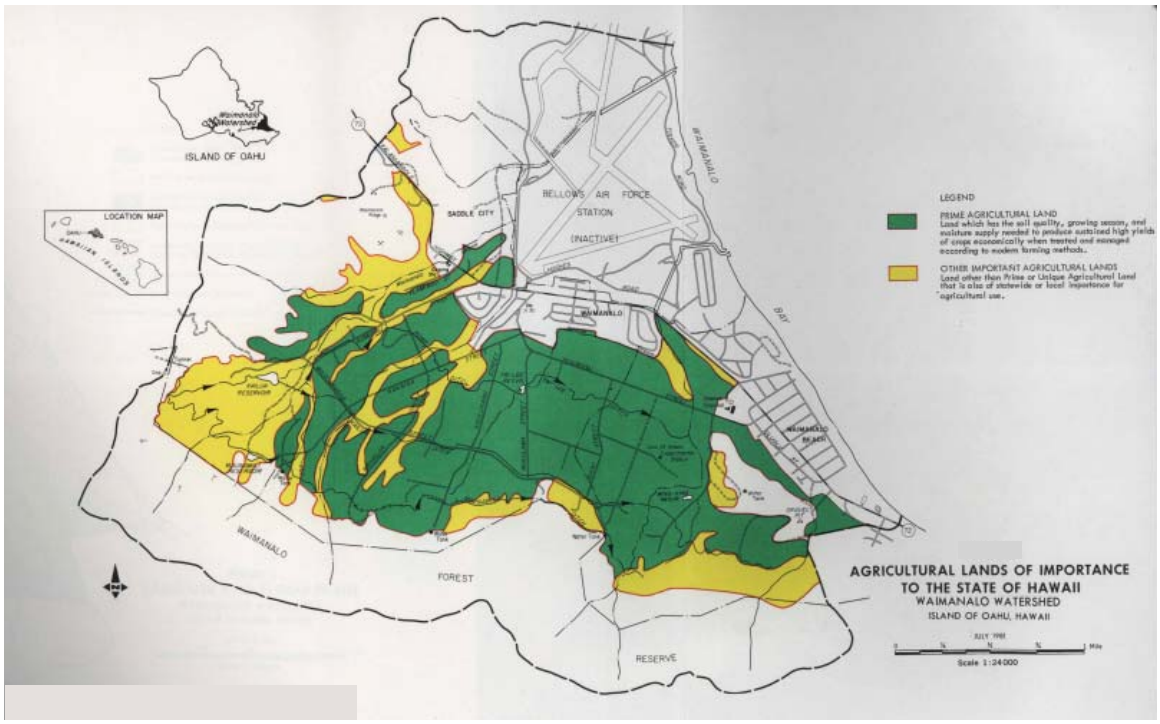


FIGURE 25 :: AGRICULTURAL LANDS OF IMPORTANCE

Image Source: Department of Land and Natural Resources, Division of Water and Land Development, Windward Oahu Soil and Water Conservation District, and United States Department of Agriculture, Waimanalo Watershed, City and County of Honolulu: Final Watershed Plan and Environmental Impact Statement. Honolulu: 1981.

FIGURE 26 :: LAND-USE MAP

Image Source: Fung Associates. Waimānalo Community Business Center: Site Selection Study and Conceptual Planning. Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008.

5.2 Waimānalo : Site Selection

Waimānalo is a town with a strong identity and a clear desire to remain small, rural and local. It characterizes an issue being faced all over the United States and the globe – the push of modernity and human development versus the preservation of open land and traditional ways of living. This conflict does not have an easy solution. Oahu's population is continually increasing which means that there is a corresponding rise in the need for housing, infrastructure and commercial centers able to serve these people. Arguably the best case scenerio for expanding the capacity of the built environment without the loss of green space is to increase the densification of already urbanized regions. That is currently the respected argument in most planning circles and is outlined clearly in the Smart Growth Principles that have been adopted by most sustainability programs, including LEED. Essentially, Smart Growth is a planning theory that concentrates development into walkable urban centers to avoid development sprawl while creating vibrant neighborhood communities[227]. That is the plan that the Honolulu Department of Permitting and Planning (DPP) has outlined in the development plans for the island. Ideally development in Oahu would concentrate in Honolulu, leaving Waimānalo to remain a small agricultural community. However, the ideals of planning theory are not always followed in reality. Despite the best intentions of the DPP, Waimānalo has seen a drastic increase in population as well as an increased gap in the financial well-being and standard of living between Waimānalo residents and residents of other areas of the island. In reality, the idealized principle of preserving open land cannot mean absolutely no development without negatively affecting local communities like Waimānalo. More accurately, the concentration of development in urban cores and the preservation of open space, outlined in Smart Growth Principles and by the DPP, are overarching guidelines, not steadfast rules. This leaves a certain amount of development that will inevitably occur. The role of the architect is to negotiate this compromise between development and preservation through sensitive

[227]Smart Growth America. "What is 'Smart Growth'?" http://www.smartgrowthamerica.org/what-is-smart-growth (Accessed October 8, 2012).

design. The theories of a landscaped architecture within this thesis will attempt to do just that.

In many ways, Waimānalo is a perfect location to test out the viability of the contemporary architectural expressions of 'landscaped architecture'. As development continues to creep into Waimānalo's agricultural land, the integration of landscape within the architecture might be used to mitigate the negative effects of the development, including: loss of aesthetic green space, loss of habitat, loss of productive land, and increased heat island effect. It might also be used to articulate the cultural identity of Waimānalo. The connection between human construct and land is already greatly established because of the agricultural nature of the culture as well as the dominating natural features of the land. The challenge of this thesis's design exploration will be how to integrate contemporary architectural expressions that fit within this context - ecologically, aesthetically and culturally. Potentially, design solutions that utilize a greater connection between architecture and landscape can help rural towns such as Waimānalo to continue to develop in ways that maintain the pastoral character of the countryside and communicate its pride in local identity. Conversely, contemporary landscaped architectural solutions may prove to be overly stylized and impractical for the functional needs of a town such as Waimānalo.

To test the potential of the 'landscaped architecture' design strategies, three sites have been chosen in Waimānalo: a single family residence, a small commercial center, and a larger agricultural tract. See Figure 27 to see a map of Waimānalo with the site locations. These three types of sites were chosen because they represent the range of architectural needs within Waimānalo, programmatically, climatically and for zoning. The design guidelines laid out in the previous chapters will be applied to these three types of design to showcase how they might be utilized for architectural developments in Waimānalo in the future.

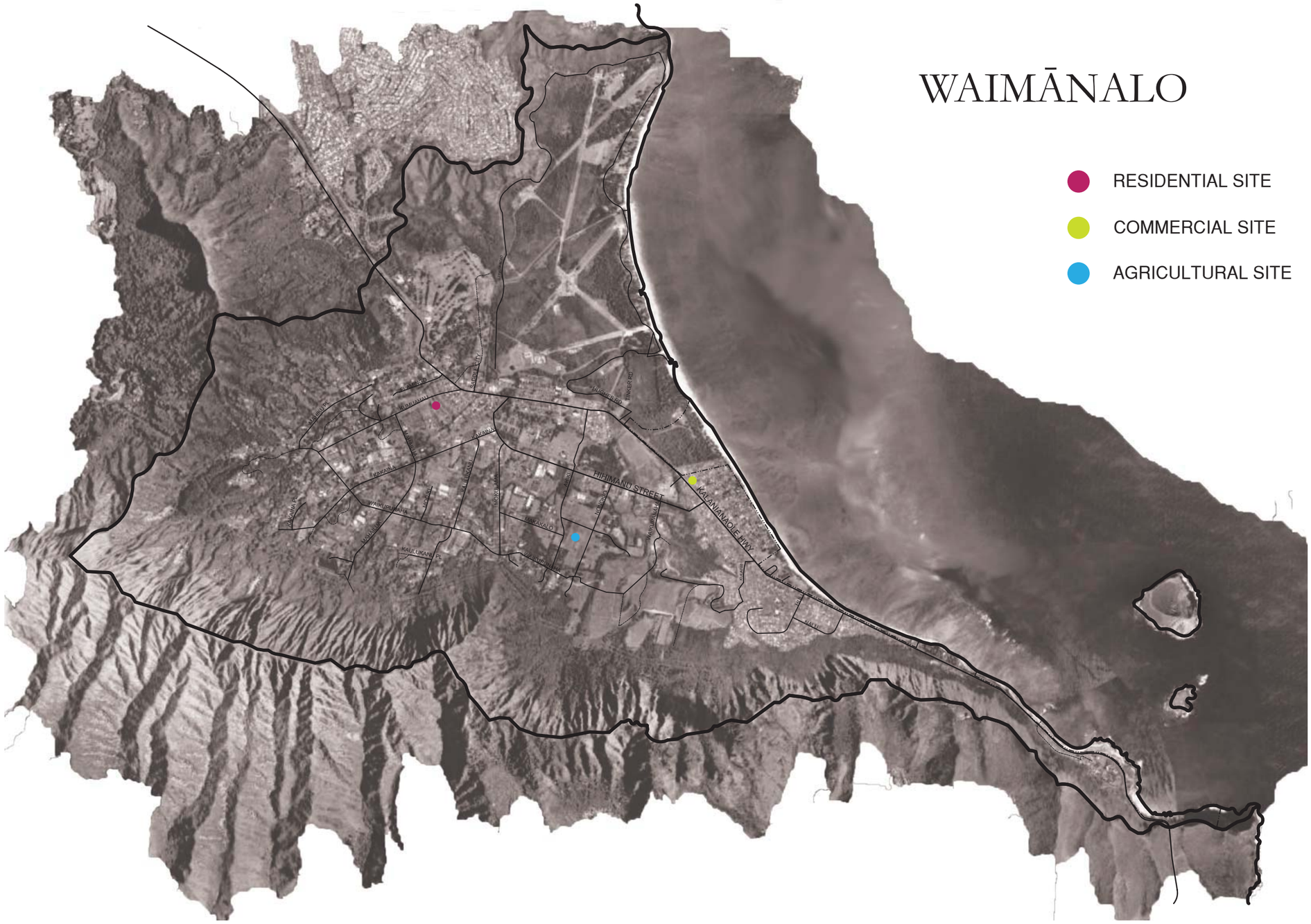


FIGURE 27 :: DESIGN SITE LOCATIONS

5.3 Residential Design

The residential site is a 5,266 ft^2 lot located at 41-1626 Kumuniu St. at the edge of one of the residential areas in Waimānalo. There are three general areas within Waimānalo where residential land-use is concentrated: the first is just mauka of Kanianaole Highway towards the southern tip of the valley generally referred to as the 'Old Homestead' area; the second is the area makai of the highway, bordering Waimānalo Beach, aptly named the 'Beach Lots'; and the third residential area is just mauka of the highway further north in the valley, referred to as the 'New Homestead' area. The site selected is on the very edge of the 'New Homestead' area, along a strip of land bordering an agricultural region. See Figure 28 for a map of the residential zones with the labeled site location and Figure 29 for a closer aerial view of the site.

This particular strip of land is interesting to examine because it represents the expansion of development in Waimānalo. It lies right on the border between argricultural land and residential land. Figure 30 shows the designated zoning for the area. As can be seen, the lot is zoned as Ag-1, which is a restricted district type defined by the DPP as intended to, "conserve and protect important agricultural lands for the performance of agricultural functions by permitting only those uses which perpetuate the retention of these land in the production of food, feed, forage, fiber crops and horticultural plants."[228] This particular land has also been identified as agricultural land of importance. Figure 31 is a closeup of the Department of Land and Natural Resources map of Agricultural Lands of Importance. Green represents prime agricultural land and yellow represents important agricultural land. Even though the entirety of Kumuniu Street is designated as agricultural land both in zoning and according to DLNR classification, it has been subdivided into residential size lots and has very recently been developed with approximatly 50 single family residences. The lot chosen is the only remaining undeveloped lot along the street. (See Figures 33-35 for images of the lot and of neighboring houses along Kumuniu St. and Figure 36 for a site plan with the

[228] City and County of Honolulu, Office of Council Services, *Revised Ordinances of Honolulu*, (Honolulu, 1990), Sec. 21-3.50 b.

environmental variables affecting the lot) All of the adjoining residential areas are zoned as R-5, defined as a district intended to, "provide areas for urban residential development."[229] The selected lot, and the rest of the lots along the street, are pushing the boundary of residential development into agricultural land, representing the continual conflict in Waimānalo between sprawling urban development and the preservation of undeveloped countryside. For the purposes of this design experiment, the design will focus on the architectural typology common to the neighborhood – a single family residence.

In order to take on the task of mitigating the negative effects of residential develop on previously open land, it is important to think about what is potentially lost and how that might be woven into the design without compromising the human needs of the residence. An even better design mentality is to think of how to create those solutions in ways that enhance the human experience. A single family residence can be thought of as a human microcosm and as such, it must be its own functioning ecosystem that supplies for human needs and environmental needs. The human needs are more evident, as they are the needs of any typical single family residence: shelter, water, food, electricity, and beauty. The ecological needs, however, are open for more discussion. If this land was previously wild before development - as in, untouched by human hands and allowed to grow in any manner that happened to evolve – than this would be a wholly different design challenge than the one presented in Waimānalo. The land, although open in the sense that it does not have a building on it, is very far from being wild. The land has been farmed and manipulated by human hands for generations and raises the question as to whether the preservation of open space is more ideally space for human agricultural usage, or unencumbered space free for the rise and fall of various local species of flora and fauna, or some compromise between the two. If we look at the zoning classification pointed out earlier in the text, Ag-1 land is meant to be preserved for agricultural production, which is not the same as

[229] City and County of Honolulu, Office of Council Services, *Revised Ordinances of Honolulu*, (Honolulu, 1990), Sec. 21-3.70 c.

unmanaged land, nor is it meant as a habitat, nor a native ecosystem. As such, the type of landscape being displaced by development is purely for human needs and does not necessarily fulfill the larger goal of this thesis, which is to find a cooperative relationship between human and environment.

The design undertaken is seeking to find a compromise between managed agricultural land, land for habitat, and land for human occupation. In order to fulfill these goals, the residential design must create as much green space as is displaced by the footprint of the building, and be comprised of a mix of managed and open green space. The building must supply for all of its own basic resource requirements, including electricity and water, as well as some of its supplementary resource requirements such as food. It must also be capable of integrating its waste as a positive resource for the site. Finally, it must showcase examples from the full range of landscaped architecture design guidelines outlined in this thesis: Transparency as Awareness, Architecture as a Journey, Retreat, Utility, Boundary, Education as Aesthetic, and Framing Nature to Redefine Beauty.

Figure 37 and 38 are renderings of the proposed design. The residence consists of three major volumes, a front of house, a back of house, and a second floor spanning over the two lower volumes. See Figure 39 for a section view of the spatial arrangement and Figures 40-42 for plans of the building. Each floor is envisioned as a clean horizontal plane with green space above and living space below, as if the ground plane were simply lifted and human activity were nestled below a verdant umbrella. The strong linear horizontal elements speak to the geometric hand of man, while the abundant greenery is encouraged to thrive atop, creating a visual symbiosis of man and nature.

On the first level, the spatial layout is designed to flow from interior to exterior seamlessly. The entrance has a large covered outdoor living space for public gatherings, something that typically occurs in carports around Waimānalo. Upon entering through the front door, the interior space is an open concept living and kitchen area that flows

directly into either a garden of raised vegetable beds or a covered outdoor dining space. The covered outdoor space then flows either into the open backyard area, or back into the interior space of the master bedroom. Once in the bedroom, the flow of space again opens to the exterior, but this time into a secluded garden retreat. The second floor continues the flow of interior to exterior. The upstairs is comprised of two bedrooms, a shared bath, and a common living space that looks down to the living space below. It is ideal for children or elderly in-laws, with private spaces are connected, but still removed. Each bedroom opens to a covered lanai surrounded by a green roof, maintaining the connection of indoor to outdoor from the private spaces as well as the public.

Every space in the house is designed to flow between public and private as well as exterior to interior and back to exterior. Air, light and human movement are able to travel between inside and outside in a variety of spaces ranging from totally private and contained to completely open and uncovered, providing for all the needs in a human habitation with the openness of the Hawaiian style living environment. In any interior room, there is open access to the exterior, so that the site and the building become one integrated human space.

Landscaped architectural design moments are woven throughout the design. The entrance is marked by a visually dramatic vertical garden that travels up the wall of the front entrance and then creates a horizontal shelf that extends into the interior. A raised bed garden flanks the south side of the house, with integrated worm tubes for the house's composting needs. The backyard is left open for play, with enough space for a large fruit bearing tree like an `ulu or avocado. Bordering the house in the backyard are two contained garden plots that serve as bio-filtration beds planted with sewage loving tropical plants, taking care of the house's blackwater while creating a vibrant garden bed. Tucked far to the rear of the lot is an area for garden storage, a seedling table and a place to store a chicken tractor that can be wheeled around the yard when desired, and put away when not. In the far left of the lot, a walled-in

secluded garden surrounds the master suite, creating a secret garden get-away. The garden opens again to the northern portion of the lot, a pathway leading to the front of the house, lined with Areca Palms. The bedrooms above have private roof gardens outside their door. The uppermost roof is another green roof, left as open green space, planted with a native species guild that will survive with little to no maintenance, giving back a small piece of the land disturbed by humans. Solar panels rise on posts above the native garden roof, taking advantage of the uninterrupted sunlight. The final touch is solar shading devices along each Southern or Western facing wall, consisting of pergola style slatted overhang laced with a vining plant acting as a hanging green screen.

All of these landscaped regions address one if not more of the landscaped architecture design guidelines. Each will be discussed below:

Transparency Equals Awareness:

The purpose of designing with transparency in mind is to find ways in which the landscape can communicate environmental processes and relationships to a building's occupants. In this way, a human is more regularly being made conscious of environmental changes, needs of the landscape, as well as being able to appreciate the beauty of a balanced, harmonious environment. Simply having as much space devoted to landscaped features as well as such a variety of landscaped features already forces the house's users to be aware of the environment around them. However, the placement of certain landscaped elements contributes to this goal.

The most evident element is the raised bed garden, which is located alongside the driveway and kitchen. This placement requires the user to see their garden every time they come and go from the house, as well providing easy access between the food growing and the food cooking. By encouraging this continual visual contact, the garden is creating a level of transparency for its state of being. A person is more likely to

maintain their garden if it is creating a potential eyesore in their front yard, and also if they are regularly using it for cooking.

A second, perhaps less noticeable example of transparency creating awareness is in the way the building reuses greywater. The water from the showers, baths and laundry machines will be filtered and directed into irrigation tubes for the landscaping. In an area such as the master suite garden, the plant life being fed by the greywater will be directly next to the source. Landscaping can be negatively affected by the use of non-biodegradable or chemically treated cleaning products; whether for the body, for laundry or for cleaning surfaces. All of these potentially harmful products would directly affect the success or failure of the landscaping surrounding the property, creating a visual cause and effect of occupant behavior. As any designer concerned with sustainability is aware, a building is only as sustainable as its users and there is frequently a behavioral training that is required to help occupants learn to use their buildings in a sustainable manner. By creating a direct proximity of disposal for water previously considered wastewater, occupants will be able to see the consequences of their product choices, whether positive or negative.

Architecture as a Journey:

The use of landscaped elements within the design is created so that an occupant is continually stimulated by natural elements while traveling throughout the house. In almost every corner, there is a visual and physical connection to nature. There is also a variety of elements created, so that no one landscaped element recedes into a background of sameness. There are landscaped elements on all planes, both horizontal and vertical, as well as a variety of styles of landscaping intended to stimulate all five senses.

Retreat:

Landscaped retreats are created for each private bedroom in the house, with the most extensive being for the master bedroom. The roof gardens for the bedrooms on the second floor create an exterior space that is semi-public, but accessible only through the individual's private space. In this way, each roof garden can be customized for the desires of the room's occupant. The garden for the master bedroom is taken to a further extreme. There is a tall lava rock wall around the whole garden space as well as large roof overhangs and planted green screen overhangs that create a visual barrier in order to maintain a high level of privacy. The master bedroom has a floor-to-ceiling window along the entire northern side of the building, creating an uninterrupted visual connection to the garden. The bathroom is even more integrated with the garden, with its own floor-to-ceiling window on the northern side of the house as well as a large opening on the western wall leading to an outdoor shower built into the garden's rock wall. The plant life is lush greenery, with visually striking flowers like Heleconia, potentially useful plants such as Awapuhi (shampoo ginger) and edibles like Dragon fruit. The idea is to create a mini Eden, where one is surrounded by abundance and secluded enough to feel free in just skin.

Utility:

The utility of the landscape is integrated into multiple features, illustrating the design mentality that utility can and must do more than simply function.

To take care of the basic needs for the house, electricity and water, renewable resource design strategies have been employed. The uppermost roof contains enough solar power to handle the electricity needs of a typical four person family. Water catchment tanks are integrated into the wall construction of the southern facing walls. Using the slim modular design of the rainwater HOG catchment system, walls of between 1-1.5' thickness can house an array of 47 gallon tanks that can be stacked and

repeated to fulfill the water needs of the house while simultaneously creating a thermal barrier to prevent heat gain. The wastewater from the house is taken through an underground solid filtration system and then brought to the bio-filtration beds on the back border of the house, where it flows through layers of earth and gravel planted with attractive sewage loving plants such as Taro, Papyrus, and Water Lilies, before joining the grey water irrigation system and watering the landscape.

Supplementary needs are also addressed through landscaped features. The raised garden beds and chicken tractor provide some of the food needed for the house. Worm composting tubes integrated into the raised garden beds make use of the kitchen waste created. Areca Palms, known for their great potential for purifying air, border the northern side of the lot, helping to create better air-quality and a lower carbon footprint. Finally, the extensive green roofs provide a powerful barrier against heat gain to the interior spaces as well as absorbing storm water and directing it to the catchment system.

Boundary:

The landscaped architectural features are design to create a boundary on the northern side of the lot with the thick row of Areca Palms, while maintaining an open feeling on the southern portion. It is designed this way because this lot is currently the last lot along the street, meaning there is a neighbor to the north, but only lovely views to the south. While this type of boundary is specifically designed for this lot, the design is also potentially useful for multiple family lots. If the design were to be duplicated in mirror image in the next lot to the south, a large shared garden and play area would be created. If those two were then mirrored along their western border, an extensive open green space and garden would be created for four families. In Hawai`i, where multiple generations of families and multiple families frequently live together, the duplication and combination of this design has the potential to serve various styles of family living.

Education as Aesthetic:

The idea of an aesthetically pleasing landscaped element that can act as an educational tool is perhaps harder to pinpoint in a private residence. This particular design guideline lends itself more to public structures. However, this element still exists in the residential design in the vertical garden at the entrance to house. The front living space for the house is created as a public entertaining area. In Waimānalo, where neighbors frequently visit one another and interact along the street front, the living area in the front of the house is the space where the private residence presents its message to the community. The vertical garden at the entrance, planted with native species, creates a strong visual statement to the community and a conversation showpiece. Every visitor to the house will be presented with the visual connection to the indigenous plant life, if not a further conversation with the homeowner of the cultural and environmental significance of the garden. It acts as a message to the neighborhood of the values of the homeowner, and creates a learning example for those that might be interested.

Framing Nature to Redefine Beauty:

Designers may help redefine cultural concepts of natural beauty by the way in which they frame landscaped elements. This is the case for the bio-filtration pools along the back exterior of the design. Potentially the most unappealing portion of a human habitation in the current cultural consciousness is human waste. It is currently dealt with by flushing it far away, with little to no regard for its final outcome. The use of living machines, employed in this design by two bio-filtration beds, is a mechanism for utilizing human waste on site as a positive resource for a visually striking bed of tropical plant life. This design has opted to celebrate this regenerative usage of sewage in order to reframe the current cultural repulsion to its natural byproduct.

Summary :

Some of the options shown within this design are currently not allowed by code. For this reason, the house, although designed to exist completely off the grid, would still maintain connections to city amenities. Hopefully, codes will change as more examples are made for alternative methods for managing human habitation. If designers begin implementing alternative sustainable design changes now, they may serve as documentable examples to help change regulations, or at the very least be able to function in that manner in the future as changes are made. The residential design for this thesis is the first represented because it is the smallest scale for the architectural design needs in Waimānalo. What it begins to show, is that landscaped architectural design thinking can be utilized at any scale, and contain the potential to enhance and vitalize architectural design.

FIGURE 28 :: RESIDENTIAL REGIONS WITH RESIDENTIAL SITE LOCATION

Image Source: earth.google.com/

FIGURE 29 :: RESIDENTIAL SITE LOCATION

Image Source: earth.google.com/

FIGURE 30 :: RESIDENTIAL SITE LOCATION - ZONING

Image Source: Department of Planning and Permitting, Honolulu Land Information System
http://gis.hicentral.com/

FIGURE 31 :: MAP OF AGRICULTURAL LANDS OF IMPORTANCE - CLOSEUP

Image Source: Department of Land and Natural Resources, Division of Water and Land Development, Windward Oahu Soil and Water Conservation District, and United States Department of Agriculture, Waimanalo Watershed, City and County of Honolulu: Final Watershed Plan and Environmental Impact Statement. Honolulu: 1981.

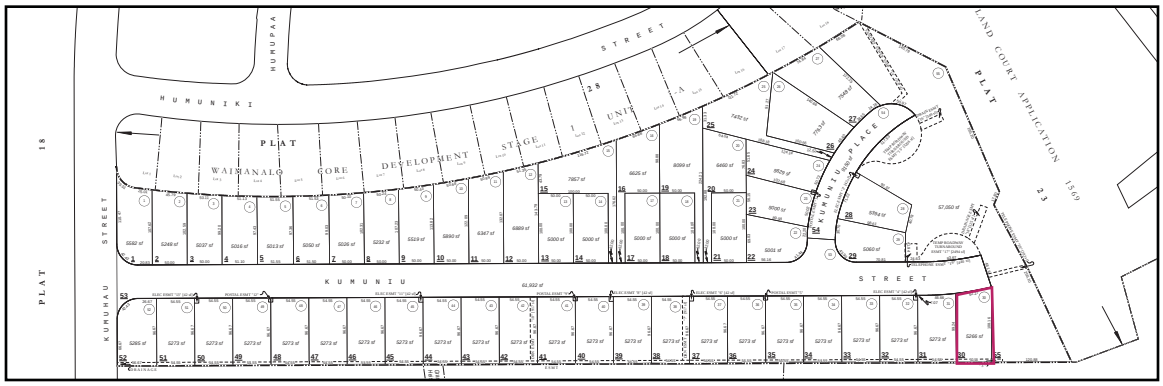


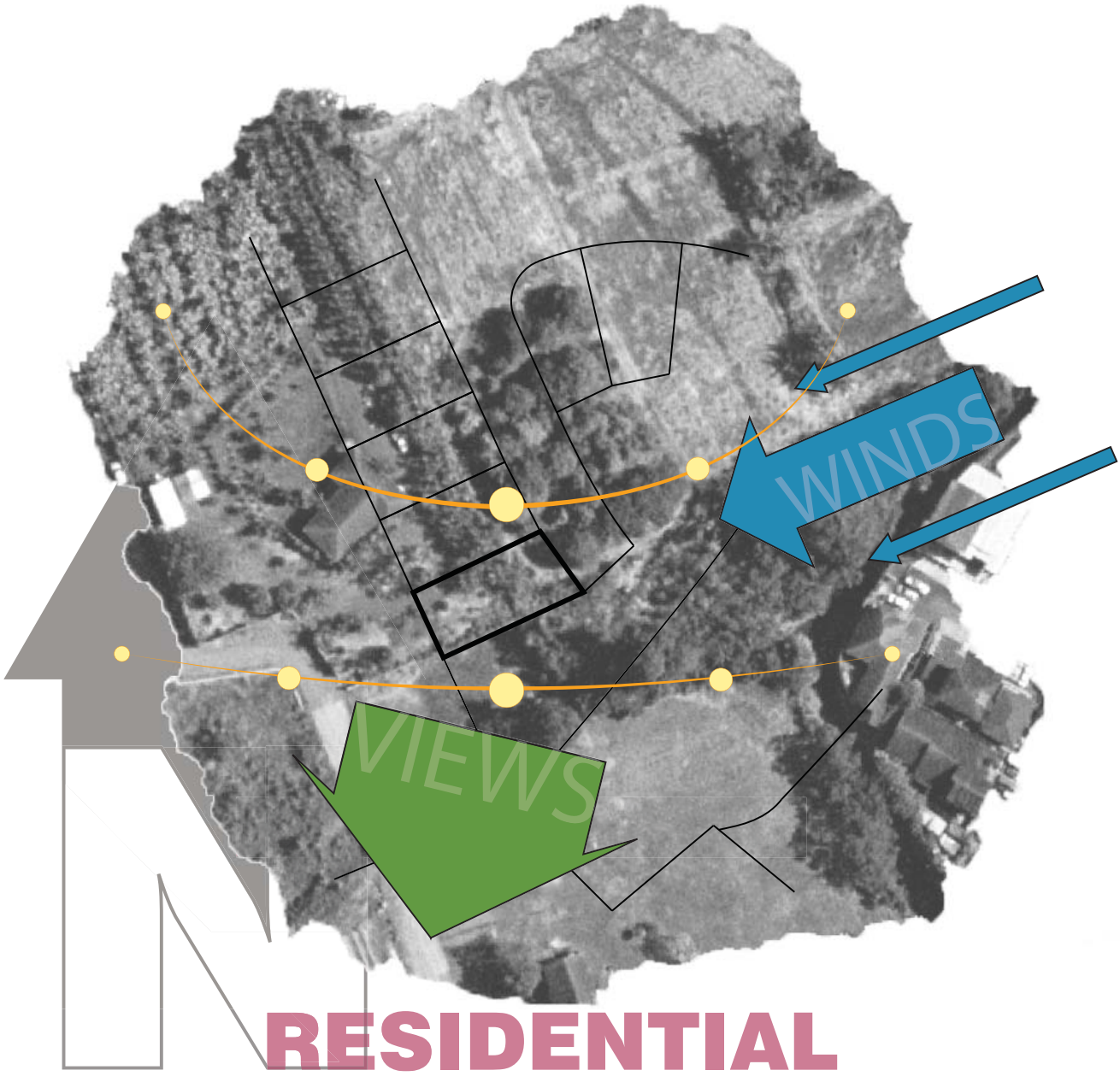
FIGURE 32 :: RESIDENTIAL SITE LOCATION - TAX MAP

Image Source: Department of Planning and Permitting, Honolulu Land Information System
http://gis.hicentral.com/

FIGURE 33 :: RESIDENTIAL SITE

FIGURE 34 :: RESIDENTIAL SITE

FIGURE 35 :: KUMUNIU STREET



RAINFALL :: 55”

PRIME AGRICULTURAL LAND

ELEVATION :: 45’ ASL

STATE LAND USE :: AGRICULTURE

ZONING :: AG-1

FIGURE 36 :: RESIDENTIAL SITE - ENVIRONMENTAL SITE PLAN

FIGURE 37 :: RESIDENTIAL RENDERING - FRONT

FIGURE 38 :: RESIDENTIAL RENDERING - BACK

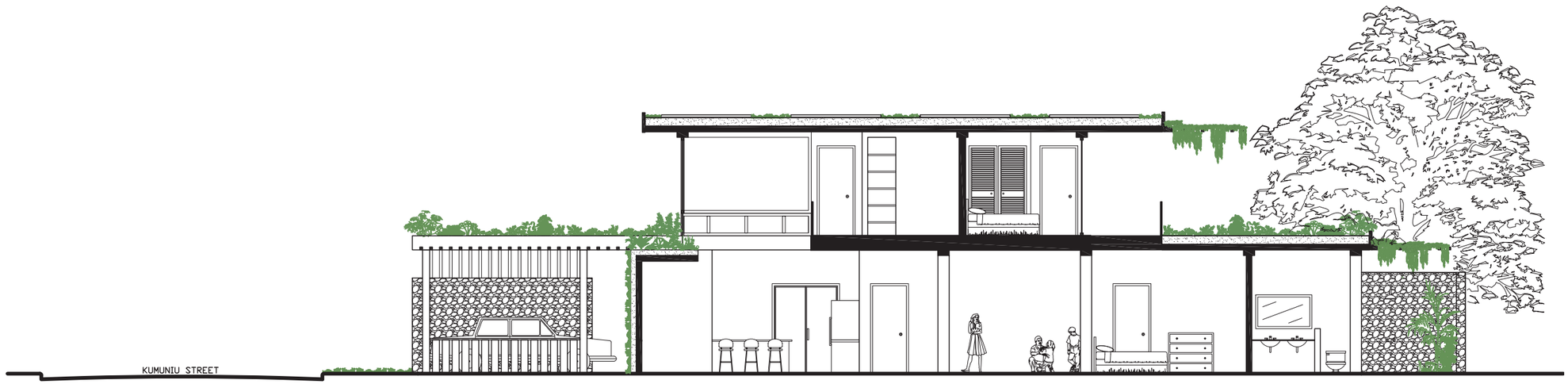


FIGURE 39 :: RESIDENTIAL DESIGN - SECTION

FIGURE 40 :: RESIDENTIAL DESIGN - FIRST FLOOR PLAN

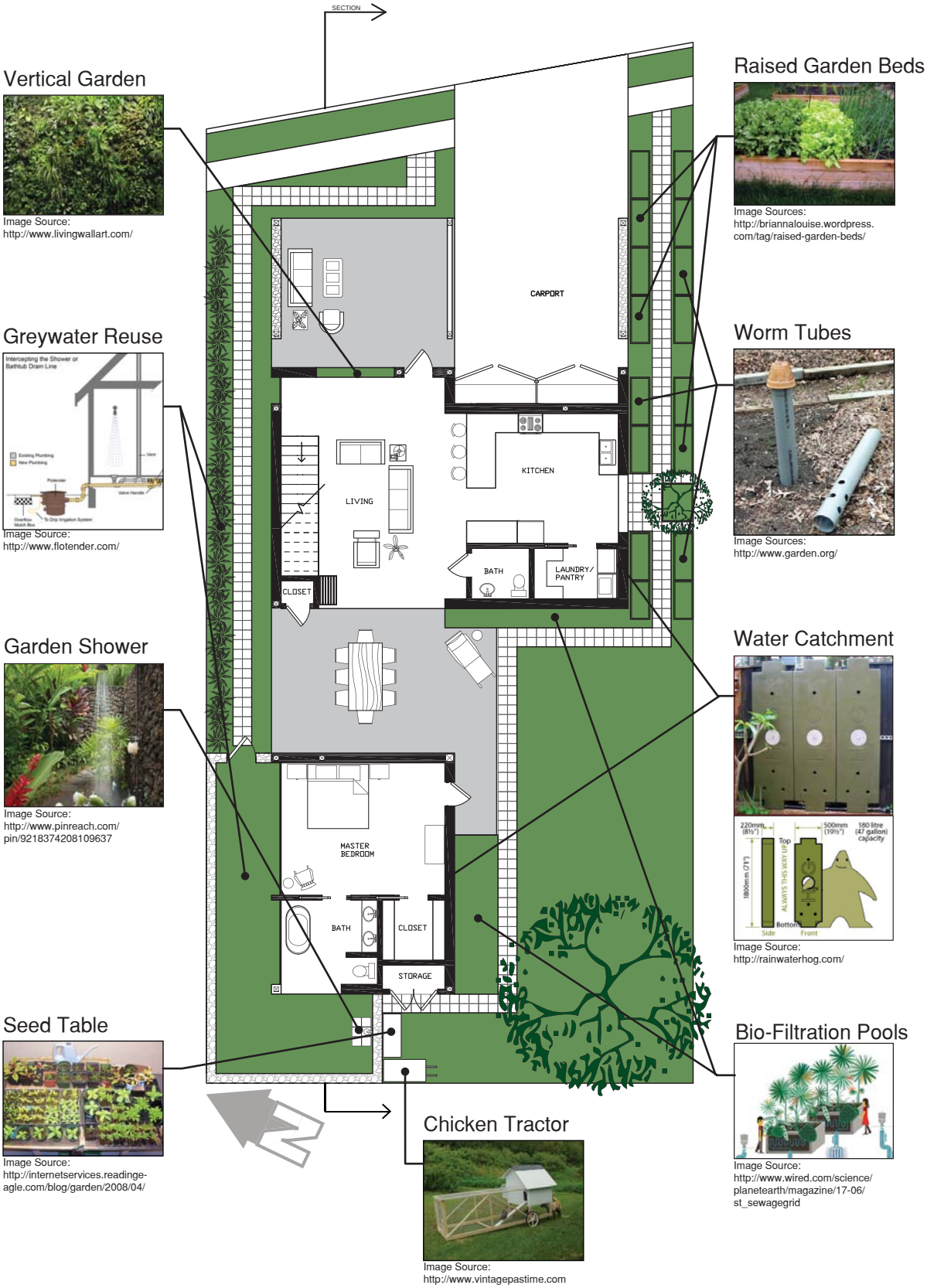


FIGURE 41 :: RESIDENTIAL DESIGN - SECOND FLOOR PLAN

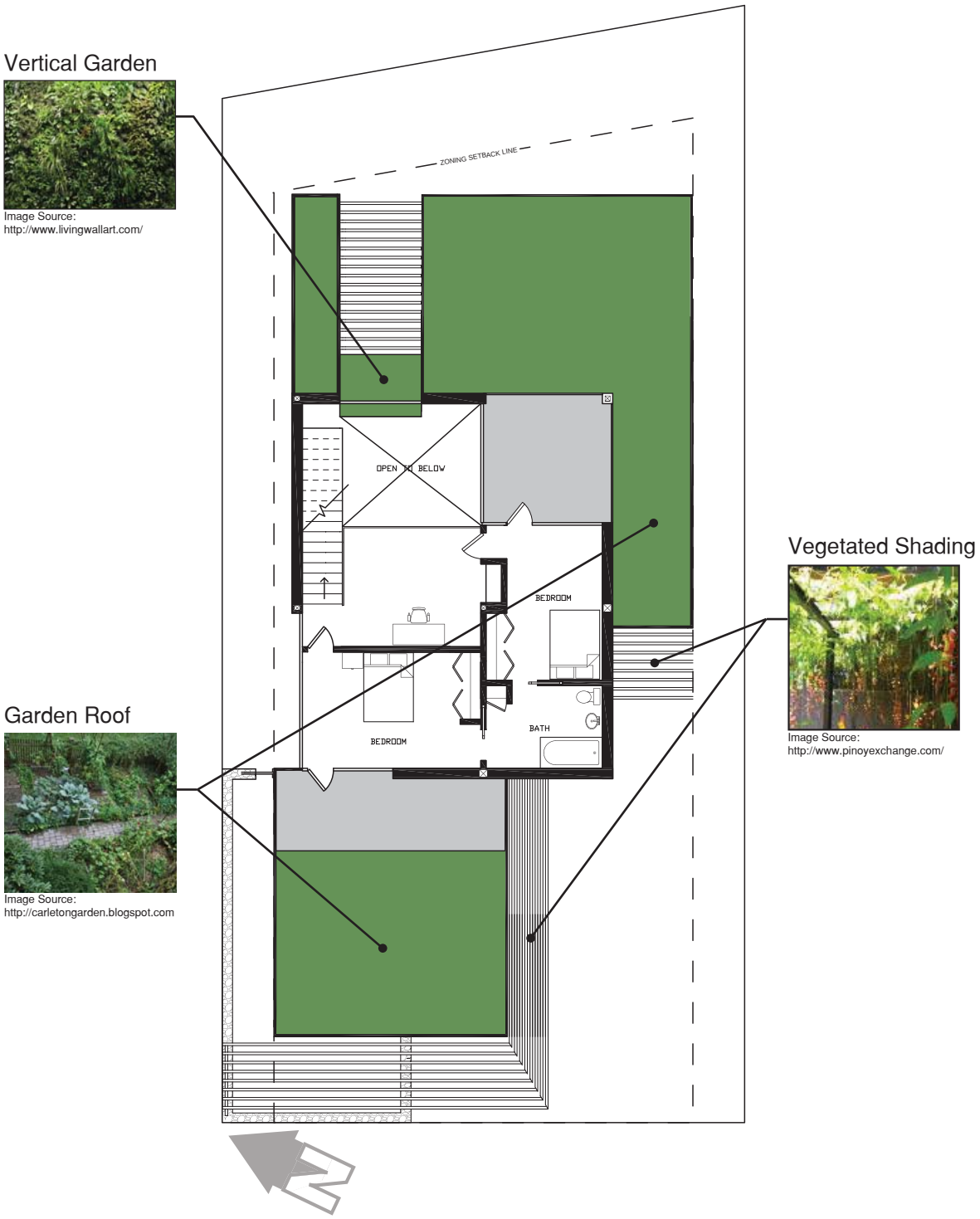
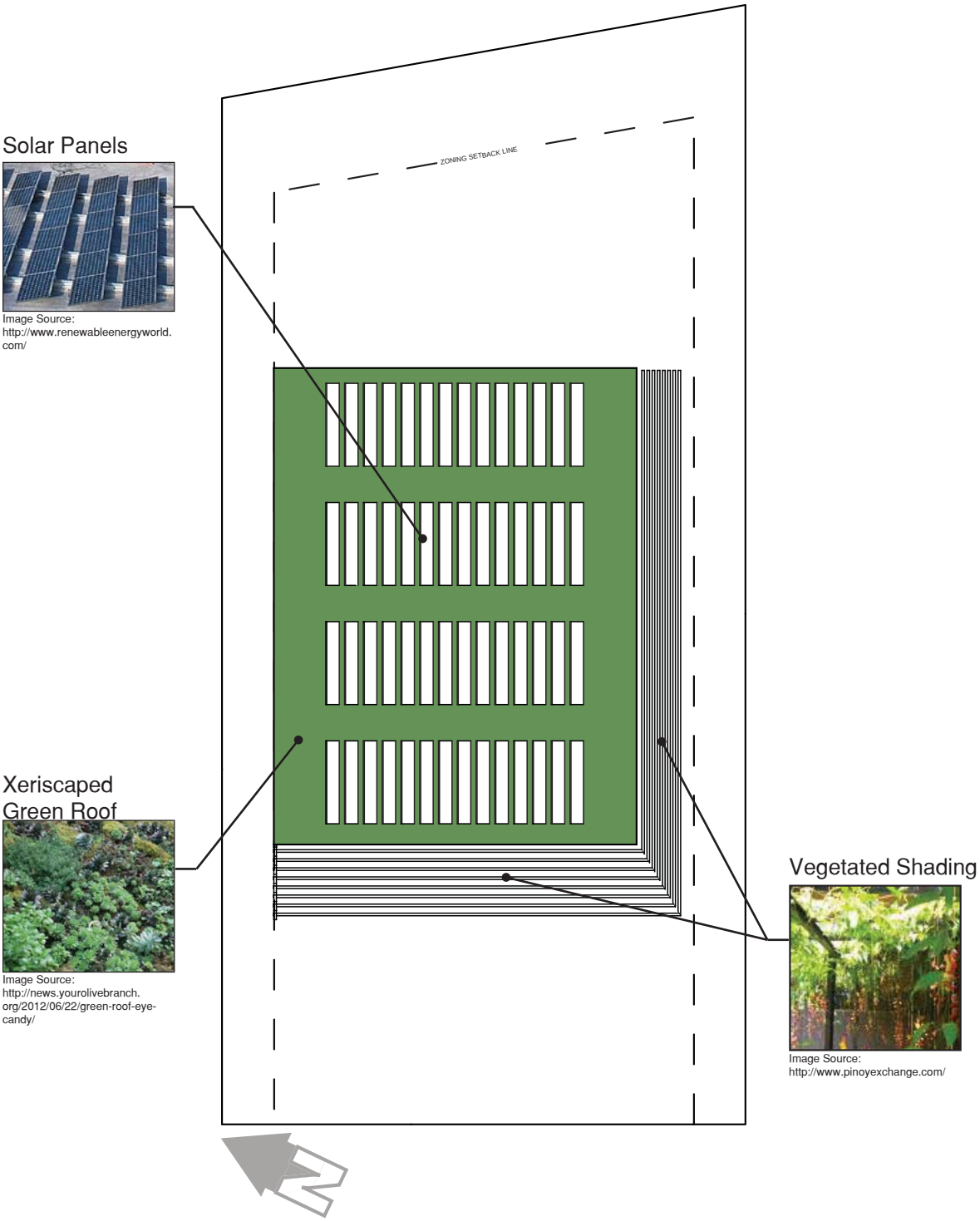


FIGURE 42 :: RESIDENTIAL DESIGN - ROOF PLAN



5.4 Commercial Design

The commercial site is located on two lots along Kalanianaole Hwy, in a small business zone adjoining the residential beach lots (See Figure 43 and 44). Due to the sustainable community development plans that work to maintain Waimānalo's rural character, there is only a very small amount of land in Waimānalo devoted to commercial activity. There are three commercial sections along Kalanianaole Highway, as can be seen represented by small black filled regions in the Waimānalo Development Map put together by Fung and Associates in Figure 45. The commercial site chosen is in the smallest of Waimānalo's three commercial areas – the middle black zone in Figure 45. The land surrounding this small business district is primarily residential to the east and south, and protected park to the north. See Figure 46 for a zoning map.

The location is ideal in many ways for commercial activity: in direct view of all of the traffic traveling down Kalanianaole Highway, next to the residential beach lots, a short walk from an entrance to Waimānalo Beach Park, and across the street from a bus stop. The lots are currently occupied by Sweet Home Waimanalo, a restaurant in a repurposed gas station, and Mel's Market, a small grocery that is now closed. See Figures 47 through 49 for two views of the street front and a view of the back side of the lots.

Developing commercial areas is a sensitive subject for an agricultural region that is working to stave off urban sprawl. A duality exists where commercial development is frowned upon because it continues the urbanization of an area that would ideally remain pastoral, while holding back commercial development can be a detriment to the economic vitality of the local community. As of this year, Waimānalo's income per capita was 35.6% less than the Hawai`i average and 33.5% less than the national average.[230] There are potentially many reasons for this disparity, but one that local residents look to is the lack of employment opportunities within their community. In a

[230] Area Vibes. Waimanalo, HI Employment & Jobs, http://www.areavibes.com/waimanalo-hi/employment/ (Accessed August 10, 2012).

government crackdown on the mis-use of agricultural land in Waimānalo in 2006, local landowner Kevin Andrews pointed to lack of available space to operate a business as the reason for land-use violations. According to the Honolulu Advertiser, "the problem is that there is little place in Waimanalo to operate a business, an issue that [Kevin] says is more serious than zoning violations . . . 'Everyone is just trying to get by.'"[231] This sentiment was realized by the main stakeholders in the region and a plan was put into place to develop a Community Business Center to increase employment and training opportunities for local residents. A report was put together in 2008 by Fung and Associates, addressing the fact that many residents in Waimānalo are unemployed or underemployed and how these statistics are affected by the "lack of available skills, capital and available, properly zoned land in the region."[232] The future development of any commercial property in the region must, then, register these imbalances within Waimānalo and work to address the needs of the local community.

For these reasons, the site chosen presents an exciting design opportunity to embody Waimānalo's unique contributions and character by channeling the local entrepreneurial energy that currently needs an outlet in the region. In fact, the site has, to a certain extent, already attracted this type of business activity. Presently the restaurant Sweet Home Waimanalo[233] is the only active commercial enterprise on the site. The restaurant is part of a larger project through Sustain Hawai`i,[234] a non-profit organization initiating sustainability projects for the future of Hawai`i. The restaurant is committed to the production and sale of organic foods made with locally grown produce and goods. The restaurant currently has a Farm Roof, a modular green roof system, which contributes to its produce needs. The restaurant is also working in conjunction with Palaka Moon Farm in a contemporary model of an ahupua`a. The farm, designated

[231] Eloise Aguiar. "Waimanalo Faces Land Crackdown", *Honolulu Advertiser*, March 30, 2006. http://the.honoluluadvertiser.com/article/2006/May/30/ln/FP605300358.html (Accessed August 10, 2012).

[232] Fung Associates. *Waimānalo Community Business Center: Site Selection Study and Conceptual Planning*. Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008.
[233] Sweet Home Waimanalo. http://sweethomewaimanalo.com/ (Accessed August 10, 2012).
[234] Sustain Hawai`i. http://www.sustainhawaii.org/ (Accessed August 10, 2012).

as a 'living laboratory', is an evolving sustainability project including various sustainable agricultural methods such as permaculture and aquaculture. The produce from the farm is used in the food at the restaurant and then the cooking grease from the restaurant is used as biodiesel to power a touring vehicle for the farm. Along with raising crops, the farm is used for workshops and educational gatherings, as a continually developing research project.

The other building on the lots, Mel's Market, although now closed, was once a much loved marketplace that served the needs of the community with local goods. They were especially known for selling locally grown produce and having a fantastic butcher counter with fresh cut meats and Hawaiian delicacies such as lomi Oio and shoyu poke. The store had a reputation as a one of the trademark spots in Waimānalo and closed only recently due to the death of one of its owners.[235] Its closing created a gap – of both a beloved local attraction as well as an outlet for the sale of local products.

The design is a new vision for both lots as a combination of the restaurant with the marketplace as part of a larger co-op style store focused on the sale of local products, food cooked with local produce, and as a gathering space for the spread of education based around local sustainability issues. The restaurant Sweet Home Waimanalo would continue to grow its mission, and be enhanced by the addition of a gathering space for forums, film showings, and classes. It would work in conjunction with the marketplace, as a center for Oahu's localvore food movement. Finally, the center would act as a sort of middleman between Waimānalo farmers and local buyers on the island, where they could bring their produce to be washed, packaged and sold. Farmers would be able to sell their produce to one location, eliminating the need to maintain multiple accounts and delivery requirements. Similarly, chefs, restaurants, and individuals would be able to come to one location to fulfill all of their local produce needs. The goal is for all aspects of locally grown food items, from the needs of the

[235] Mel's Market. http://www.kanuhawaii.org/ (Accessed September 2, 2012).

farmer to the needs of the consumer, to be fulfilled in one location. It would become a community gathering place, commercial at its base, educational by bringing all of the issue's angles to one location, and attractive by the vitality of its many contributors. The architecture for a project such as this would be greatly enhance by integrating landscape within the built environment as a manifestation of the principles inherent to the project. It presents a wonderful opportunity for the integration of natural systems with the built environment as a functional, aesthetic, and culturally significant example of sustainability potential for Hawai`i.

Program

Restaurant:	Kitchen Dining Area: Café and nicer sit-down restaurant Sales Counter
Multi-Purpose Space:	Gathering Space for approximately 40 people Film Projection Storage Space Parking Permaculture garden examples
Marketplace:	Sales Counter Produce stands, product shelves, and display refrigerators Deli Food Storage Area
Food Production Area:	Washing and Packaging Area Back of House for incoming/outgoing deliveries

Figures 51-54 are renderings of the proposed design. The main structures for both Mel's Market and Sweet Home Waimanalo were maintained and revitalized to preserve the feeling of the small country storefront common to the downtown of many rural Hawai`i communities. Contemporary architectural volumes made with reclaimed wood intersect with the old Hawai`i typology, weaving above, between and behind the two structures to create a meandering blend of modernity and tradition. Vegetated

segments are integrated throughout as though the architectural elements were entwined by vegetation.

Figure 55 shows an area plan of the site. The vehicular circulation for the lots is designed to flow along the outer edge of the lots, leaving a large open central plaza area for pedestrian activity. The main entrance for visitors is accessed from Kanianaole Highway, while a separate entrance is created in the northern rear of the site for farmers, deliveries, and employee parking. The back entrance is accessed through a right-of-way agreement with the neighboring business, currently McDonald's, and out onto a side street of Kalianaole Highway called Aloiloi Street. Visitors and customers are able to access the building from multiple points. Some parking is maintained in the front of the building for quick stops and low traffic times, while an overflow parking area is created in the rear for those staying longer. Pedestrian activity from the rear flows through an opening between the two sides of the building and into the main central plaza area.

The first floor of the design is shown in Figure 56. The café for Sweet Home Waimanalo remains in the structure on the right of the plan, but has been altered to accommodate a new larger kitchen to the rear of the café, a staircase leading to a second story restaurant, and a new outdoor seating area oriented to the pedestrian-friendly central plaza space. The market is similarly kept in the same location, with a new expansion to the rear of the structure housing the food reception and processing area. The entire first floor reflects the path of food from farm to table. The produce coming from local farms enters the washing and packaging area, and is then either sold in the marketplace or brought to the kitchen to be cooked and sold in the restaurant.

While most of the first floor design is geared around the creation of a gathering space for shopping, eating and sharing, it is also designed to support quick functional shopping through the integration of a Community Supported Agriculture (CSA) program. CSA is a method of getting fresh local produce to consumers by the creation of a weekly produce box filled with the food that is in season and available from a local farm, usually

either delivered or available at a designated pick-up location. Typically this method of sales is a business strategy run by individual farms. In this design, a CSA program is created with the produce from many local farms. There is a CSA pick-up counter at the front of the marketplace for those wishing to make one quick stop for their produce shopping. Farms are freed from having to market their products, while the produce boxes have a more diverse stock and a convenient pick-up location.

The second floor plan, seen in Figure 57, is designed for activities that last for a longer time. The area above Sweet Home Waimanalo is a restaurant that caters to a more leisurely and luxurious dining experience. The restaurant is mostly open air, with an extensive roof garden enclosing and intertwining with the dining area, creating a relaxing vegetated setting for finer dining. The second floor above the marketplace is the gathering space for classes, forums and films, with an office space for the building's owners. Directly outside the classroom is another extensive roof garden, housing an example of the sustainable agriculture and permaculture principles being taught in the space. Hands-on demonstrations and educational landscape displays contribute to the pedagogical viability of the space.

The two extensive roof gardens on the second floor combine to create a striking visual image of greenery literally growing out of the top of the traditional Hawaiian typology. The unusual landscaping also acts as a mediator between the traditional architectural elements and the contemporary architectural volumes. It is as though the contemporary architecture is growing from the traditional Hawaiian architecture, a symbolic statement for the ways in which the future of Waimānalo must grow from a celebration of its cultural roots. To get a better understanding of the vertical relationships of the green spaces, see Figure 59 for a section of the building.

The uses of landscaped architectural design components help enhance the driving values behind the local food center, celebrating the rich landscape types common to Waimānalo, from natural to agricultural. The main central plaza space for pedestrian activity is designed with a dramatic sunken rain garden with elevated

platforms that allow pedestrians to walk without interruption, but simultaneously able to see through to the garden below. Two oval sections in the center of the plaza are left without the elevated platform, allowing the wetland garden to burst forth and act as a striking centerpiece around which activity flows. The design of the garden is a re-creation of the wetland ecosystems common to the area. It also acts as the final destination for all of the rainwater that hits the site. Every landscape element acts as a funnel to this central rain garden.

The rear of the lot is a fifteen foot wide landscaped boundary between the residential neighborhood and the commercial activity. The land is bermed with the furthest edges of the property line raised approximately six feet above the site level. This has the dual function of creating a visual barrier between the neighbors and the parking lot as well as a multi-level garden along the slopes of the berm for visiting customers. Functionally, it also directs water to a gutter system that feeds into the central rain garden.

The extensive roof gardens on the second floor are essentially raised garden beds that create a vegetated border along the edges of the buildings. The gardens create a strong visual statement for the building frontage, while simultaneously enhancing the activities of the second floor spaces in direct proximity. Functionally they act as a storm water management and water catchment system that similarly directs water to the rain garden below.

Finally, the uppermost roof space, seen in the roof plan in Figure 58, has a less intense roof garden in-between the two major contemporary architectural volumes, designed as a xeriscaped landscape of native plants requiring little to no maintenance and supplying a pocket of habitat. This green roof is extended vertically downward with a green screen along the rear portion of the lot. Plants are able to trail downward from the top roof garden and form a green wall of vegetation intertwined with the wooden screen members. The effect of the green roof and green wall creates a vegetated wedge nestled between the two larger volumes of reclaimed wood.

Each of these landscaped architectural elements combine to produce an overall experience for the building, one that speaks to the values of the activities happening within. It is a celebration of the local landscape, both the naturally occurring landscapes as well as the agricultural landscapes that supply the food and function for the area. It also incorporates every one of the seven design guidelines outlined in this thesis. A further analysis outlining each theoretical guideline follows.

Transparency Equals Awareness:

The design strategy of using transparency as a mechanism for creating consciousness is utilized in almost all of the landscaped elements in order to celebrate the values behind a local food center. Just as the ideas of the center focus on the observance of local agricultural knowledge and production, so too does the architecture clarify these origins and processes. The center of the site circles around the sunken rain garden, which acts as a sort of heart to the design. The re-creation of the native wetland ecosystem is a pocket of what the land could be without the presence of humanity. It acts as a visual reminder of the source for the fertility of the region as well as the literal catch basin for the site's overflow. It is a visual reminder of both where the land is coming from and where things progress to.

To continue the transparency of the local relationship with land, two walls of windows are open to the central courtyard, revealing the activities within. One wall shows the processing of the produce from the farm – how it is washed and packaged. The other reveals the kitchen - showing how the produce is processed for consumption. These activities, which are typically hidden from public view, are celebrated in this design. These simple architectural elements encourage the intent of the site, which is to bring focus to local food activities, from farm to table.

Architecture as a Journey:

Similar to the residential design, an architectural experience is created with landscaping by ensuring that natural elements of a variety of types are visible from all spaces on the site. This connection to landscaping begins as soon as a visitor enters the site. Arriving by car and parking in the rear, a visitor is confronted with a bermed wall of garden, creating a nested, internal feeling for the lot. Then facing the building, the visitor is visually confronted with volumes of reclaimed wood arising on either side of a dripping wall of vegetation. The entrance to the main courtyard takes the visitor under the wall of greenery, as if passing though a vegetated curtain, and then opens into an expansive plaza of activity. Below the visitor's feet, the plaza is made with tiles spaced to accommodate grass growing between, all centered on the sunken rain garden. The tiled plaza floor walks above and around the sunken garden, with the combination of solid and glass tiles that encourage one to look below to the thriving wetland garden beneath. All interior spaces continue the connection to the central plaza by utilizing large openings or windows. Even from the second floor, the central circulation space is consistently visible, to encourage a continual connection to the unusual garden and the circulation of people.

Once on the second floor, the architectural journey transitions from public and active, to more leisurely and semi-private. The center of the second floor remains fully public, but soon leads to either a restaurant or classroom with exterior spaces that become enclosed by vegetation. Extensive roof gardens bordering the edges of the outdoor roof lanais define a specific type of arrival, whether engaging and educational for the classroom, or luxurious and restful for the dining area.

Each landscaped architectural element helps translate a sense of the journey to the visitor, whether encouraging motion or rest, awakening or arrival. The variety of elements stimulates the many senses. At times the visitor is called to attention by an unexpected style of garden, while other times the visitor is lulled by a surrounding of vegetation that fades into a wall of lush surrounding. The landscaped architectural

elements become defining elements of the human understanding of space in the building.

Retreat:

The sense of retreat is created at the end of the architectural journey. Here this is accomplished with the extensive roof gardens on the second floor. There are two types of arrival in this design.

On the restaurant side of the second floor, the extensive roof garden is designed as a dense and lush surrounding to create a garden get-away for a luxurious dining experience. The intent of the garden is to surround the diner with an envelope of greenery that allows for an elegant garden picnic feeling. While the café below is actively engaged with the activity of the central courtyard and encourages a high turnover rate, the dining experience above is made to feel more relaxed and extended by the creation of a vegetated retreat.

The classroom side of the building also creates a retreat with its extensive roof garden, but in a different way. The lanai off of the classroom is intended to be an exterior extension of the classroom space. The landscaped elements are pedagogical tools – active spaces that engage learning with hands-on experimentation. It is a safe zone for learning and becoming physically involved with the sustainability curriculum. The roof garden for the classroom is a retreat in the sense that it is a free space that is owned by its creators. The students actively participate in the creation of their classroom area, the physical connection creating a psychological sense of ownership and pride. The space then takes on a sense of personal connection inherent to the implication of comfort and belonging.

Utility:

Each of the landscaped elements contributes to the utility of the building. The bermed garden along the rear helps direct rainwater to the sunken garden in the interior, acting as a stormwater management system. The upper story roof gardens similarly control stormwater and direct the flow to the sunken garden. Greywater from the building also feeds into the rainwater garden, where it is filtered and depolluted by the wetland plants before it seeps into the ground and recharges the water table.

The vegetated roofs and green screen along the rear act as insulative factors for the building, reducing solar heat gain and lowering the energy needed for space conditioning. The roof gardens also provide some of the food available to customers in either the marketplace or eateries.

Finally, all of the green spaces help moderate the heat island effect typical to a commercial location. Unlike the expanses of bare roof and paved parking lots characteristic of the standard commercial center, this design utilizes multiple green spaces and permeable tiling solutions to create a cool and porous site.

Boundary:

A clear boundary is created along the rear of the site with the bermed garden. The mounding earth and layered vegetation create a visual and physical barrier between the commercial activity and the surrounding residential lots. By raising the earth as well as implementing a thick wall of vegetation, the delineation between areas is especially strong. The lot becomes a physical basin.

A further boundary is created with the wall of vegetation between the parking lot and the main pedestrian circulation in the central courtyard. The trailing plants cascading downward from the uppermost roof garden act as an aesthetic boundary,

helping to define the edge of the building envelope and the beginning of the site's activity.

Education as Aesthetic:

The use of education as a way to engage visitors is present on multiple levels in this commercial design. The sunken rain garden is a deliberate statement showcasing natural ecosystems common to the area. While there are many protected wetland zones in the Waimānalo area, they are mostly isolated and protected within the federal land occupied by Bellows Air Force Base. The sunken rain garden is a pocket of this locally important type of ecosystem brought to the attention of the visitor by its prime location. Informational plaques and paperwork about the makeup and the garden and its connection to the flow of water along the site would be available to visitors to allow further learning for those interested.

The second floor garden space next to the classroom is another use of landscape as both education and aesthetic. While the rain garden is managed and maintained by professionals, the education potential for the second story garden is a transformational space encouraging active engagement. It is a location where permaculture and sustainable agricultural strategies are implemented through the workshops and classes happening on site. It is an active educational landscape that is also a visual statement for passing traffic. The storefront of the market is enhanced and make unique by the landscape shaped by the students and teachers – visually pronouncing sustainability as an essential part of the identity of the building.

Framing Nature to Redefine Beauty:

The sunken rain garden utilizes a distinct framing mechanism to bring attention to the native wetland ecosystem, in order to showcase the beauty of native plant life.

Unlike a typical garden, the rain garden is sunken just below the ground, with the main level of traffic floating around and just above the garden. It is centrally located, which forces the attention of the circulating pedestrian activity, but also utilizes an atypical style of garden plot to draw special attention to the landscape. Visitors can walk above and around, seeing multiple intriguing visual angles of the garden, creating a framework that brings a level of appreciation and awareness to this protected natural ecosystem.

Summary :

What is essential in the use of a landscaped architecture for this commercial center is the ways in which it translates the values of a local identity that is strongly connected to the land and leading the way for sustainability on the islands. Every landscaped element contributes to an overall experience for the visitor, one that defines a new type of commercial space. The overall concept for the site - creating a commercial site focused on the sale and celebration of local agricultural expertise and rural identity – already embodies a growing movement in modernity to re-establish cultural roots, increase awareness of the food chain, and encourage a healthier relationship with the land. The addition of a contemporary design language, through the incorporation of landscaped architectural elements, embeds these ideals within the architecture. It creates a striking contemporary outlet for the entrepreneurial activity in Waimānalo that is trying to be a leading example in Hawai`i of the locally based sustainability movement.

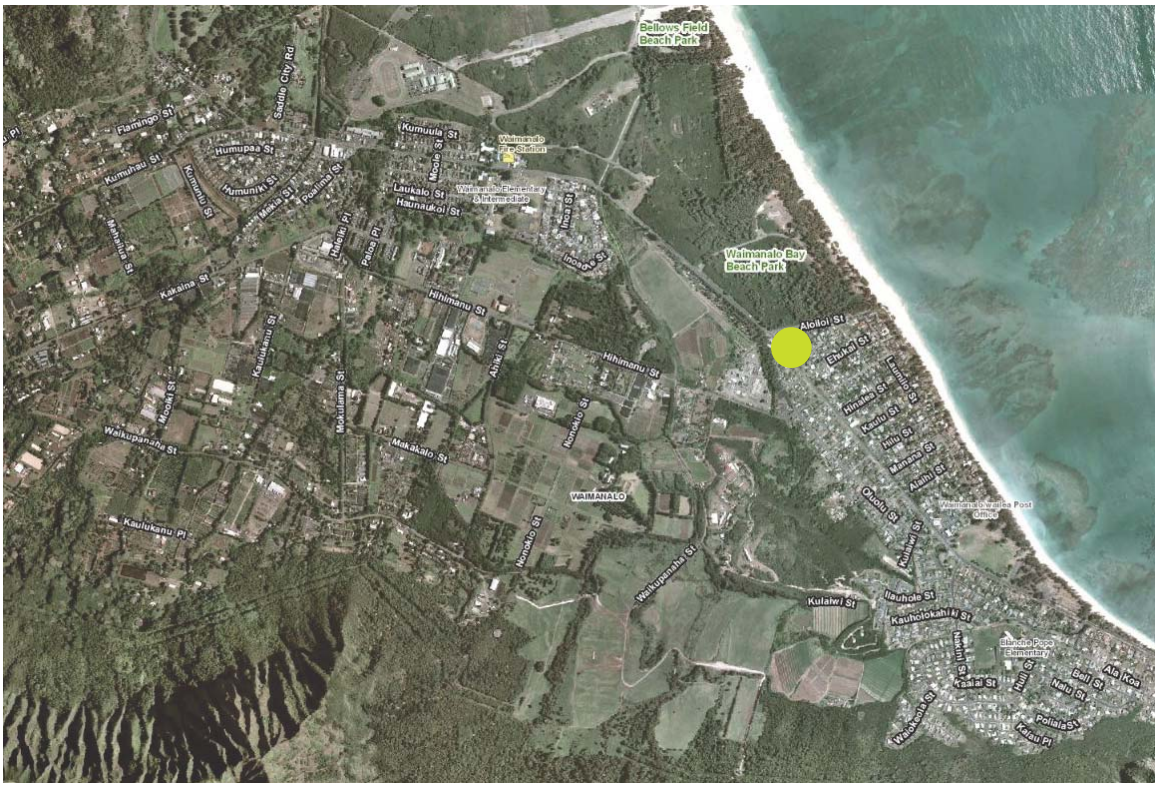


FIGURE 43 :: COMMERCIAL SITE LOCATION

Image Source: earth.google.com/

FIGURE 44 :: COMMERCIAL SITE LOCATION

Image Source: earth.google.com/

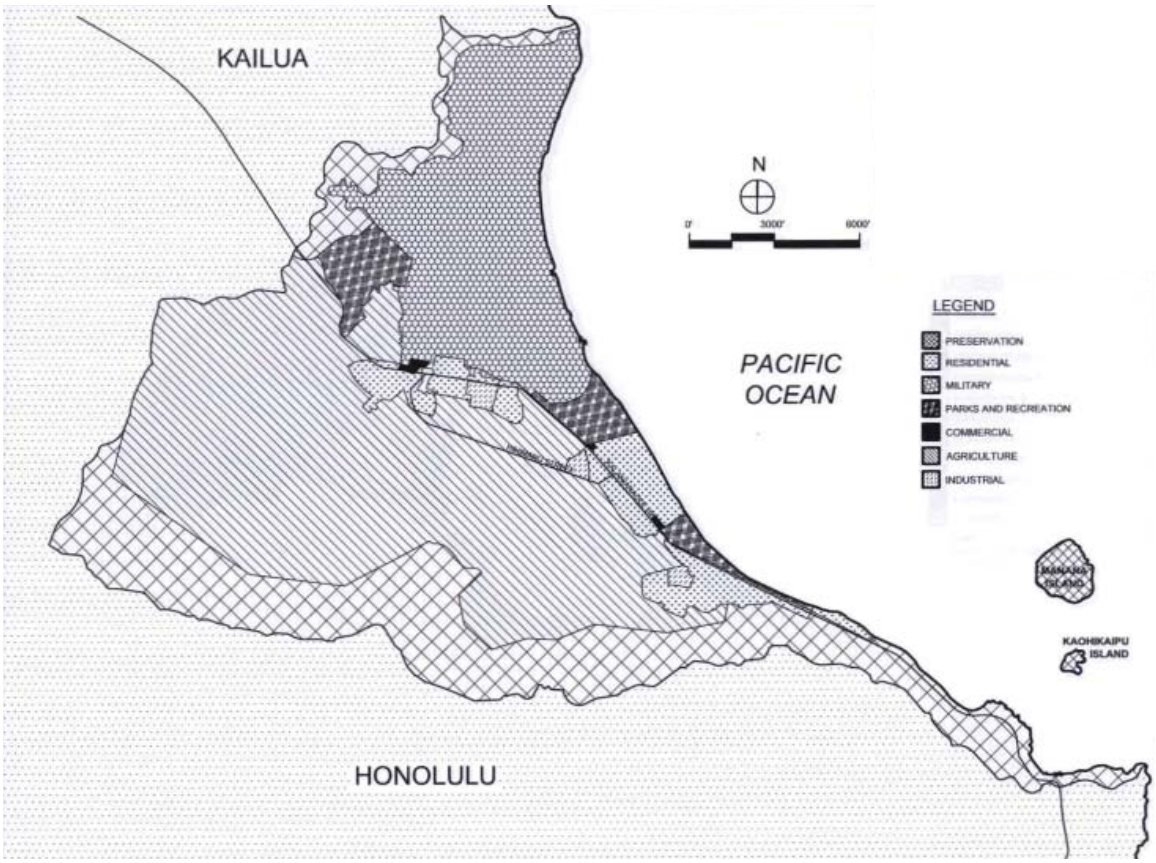


FIGURE 45 :: WAIMĀNALO DEVELOPMENT MAP

Image Source: Fung Associates. Waimānalo Community Business Center: Site Selection Study and Conceptual Planning. Honolulu: City and County of Honolulu Department of Permitting and Planning, 2008.

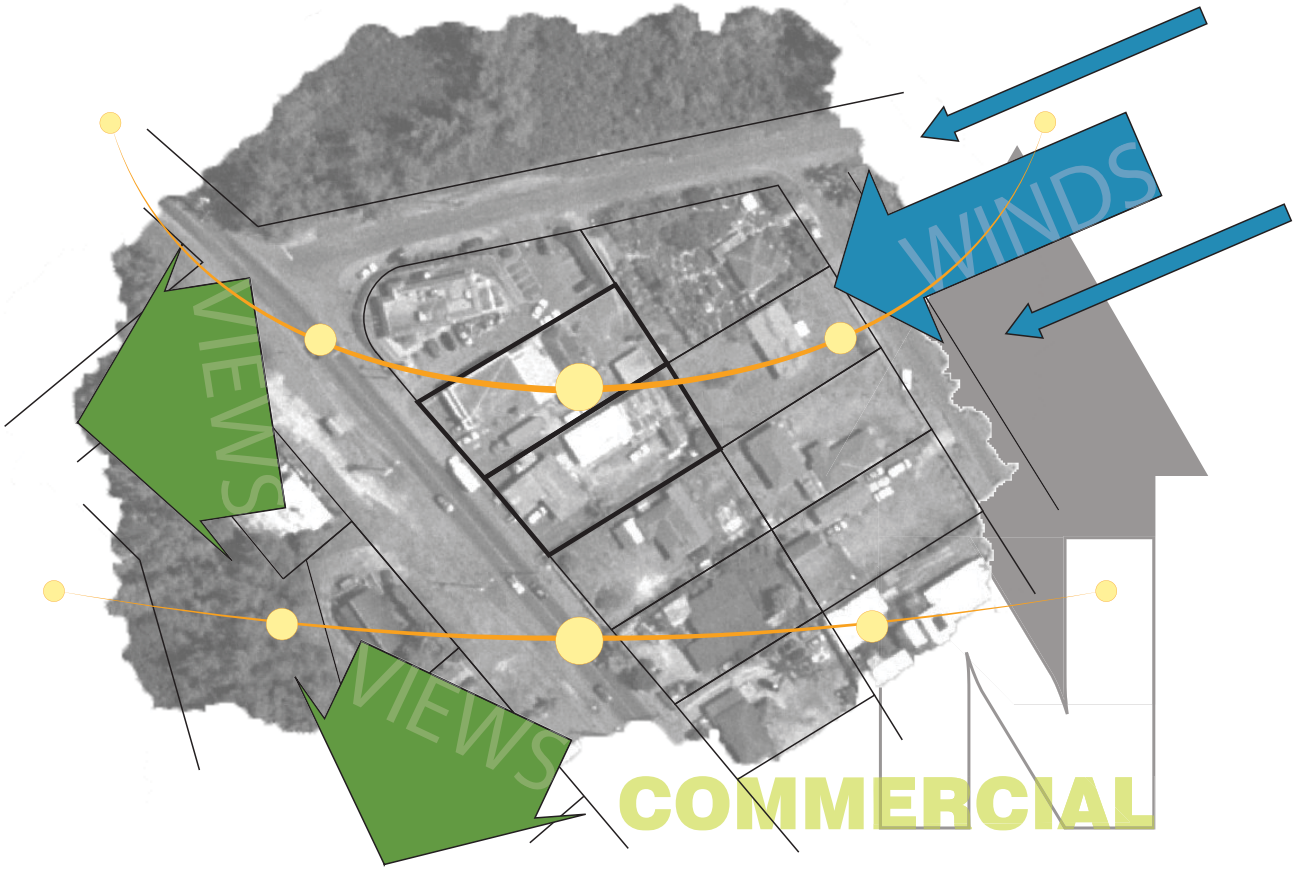
FIGURE 46 :: COMMERCIAL SITE LOCATION - ZONING

Image Source: Department of Planning and Permitting, Honolulu Land Information System
http://gis.hicentral.com/

FIGURE 47 :: COMMERCIAL SITE - FACING NORTHEAST

FIGURE 48 :: COMMERCIAL SITE - FACING SOUTHEAST

FIGURE 49 :: COMMERCIAL SITE - FACING THE BACK OF THE LOTS / SOUTHWEST



RAINFALL :: 45”

NOT SPECIFIED AGRICULTURAL LAND

ELEVATION :: 10’ ASL

STATE LAND USE :: URBAN

ZONING :: B-1

FIGURE 50 :: COMMERCIAL SITE - ENVIRONMENTAL SITE PLAN

FIGURE 51 :: COMMERCIAL RENDERING - FRONT

FIGURE 52 + 53 :: COMMERCIAL RENDERING - AERIAL

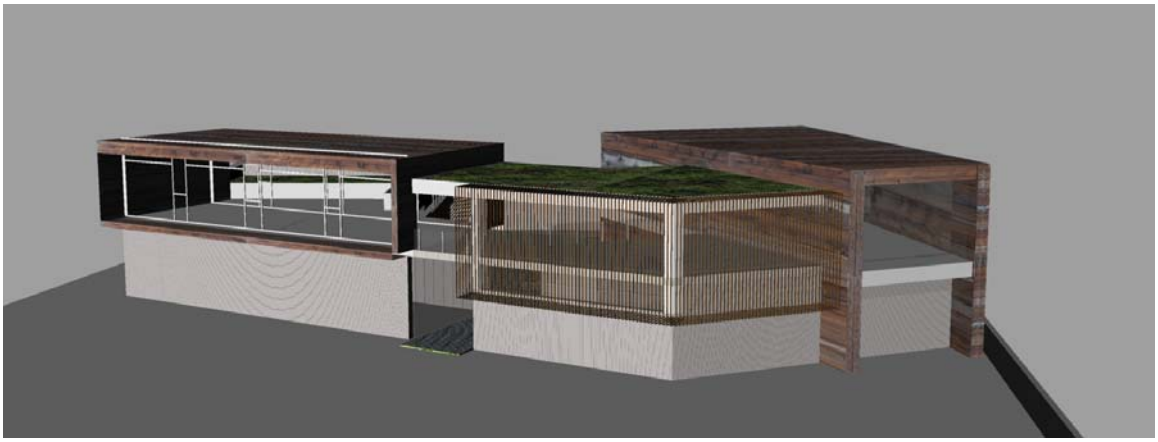


FIGURE 54 :: COMMERCIAL RENDERING - BACK

FIGURE 55 :: COMMERCIAL DESIGN - SITE PLAN

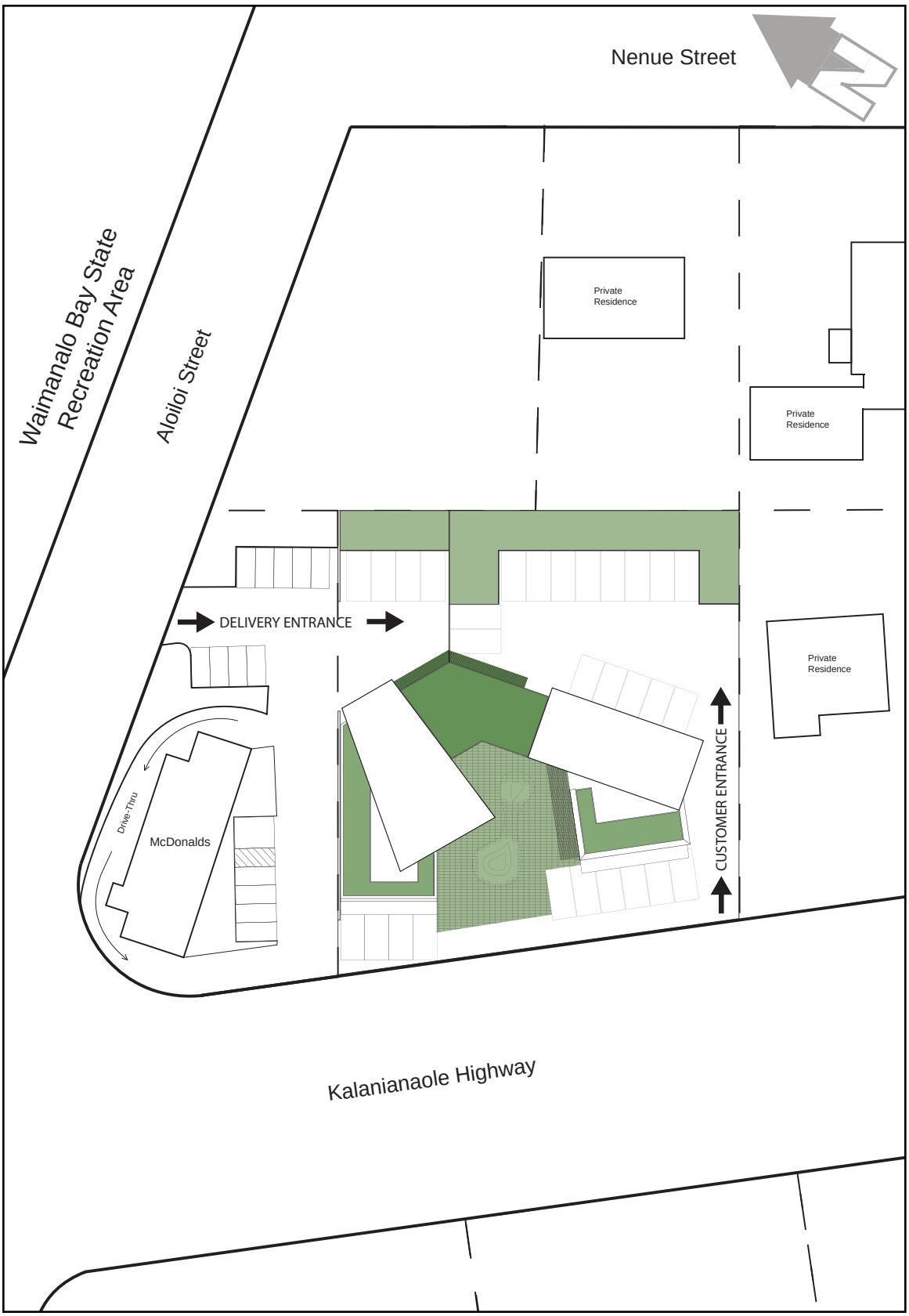


FIGURE 56 :: COMMERCIAL DESIGN - FIRST FLOOR PLAN

Bermed Garden

Image Source:
http://www.ehow.com/how_12040315_build-planting-berm.html

Windows to Food Production

Image Source:
http://www.smh.com.au/news/restaurant-reviews

Rain Garden

Image Source:
http://ecosrq.com/bioswale.html

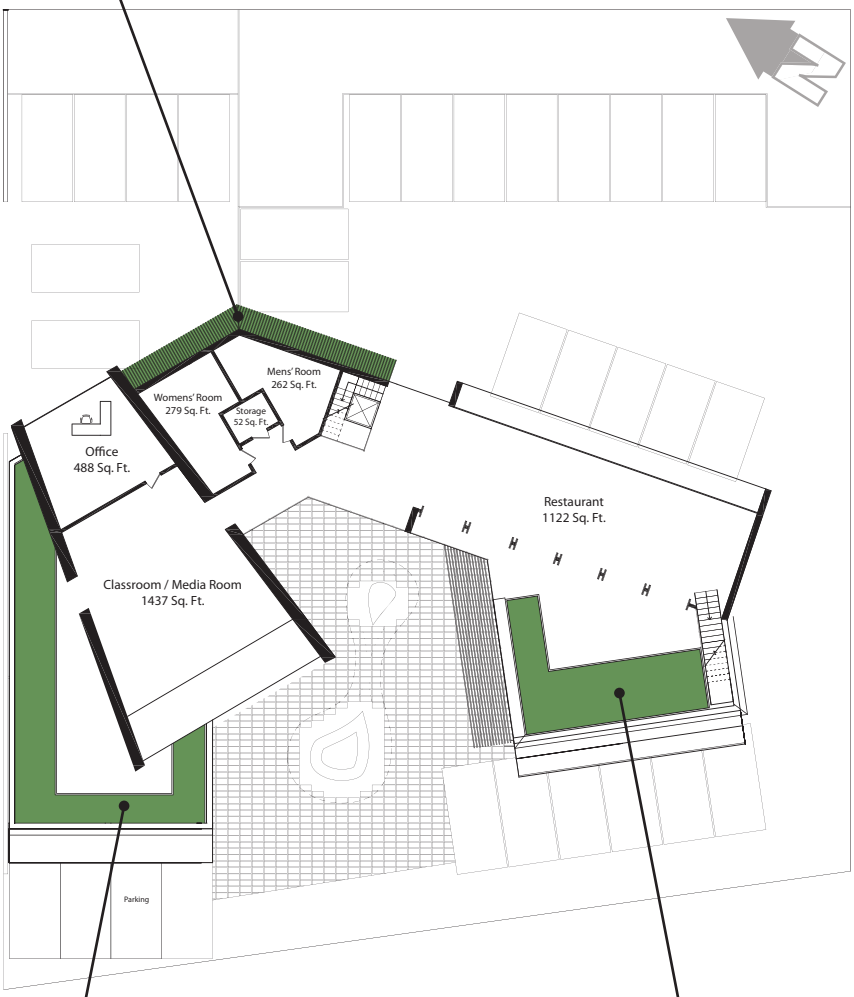
Elevated Path

Image Source:
http://www.flickr.com/photos/lao_ren100/2474282501/sizes/o/in/photostream/

FIGURE 57 :: COMMERCIAL DESIGN - SECOND FLOOR PLAN

Plant Screen

Image Source:
http://www.milcosolutions.
com/screening.php



Permaculture
Example

Image Source:
http://permaculturesanctuaries.
blogspot.com/

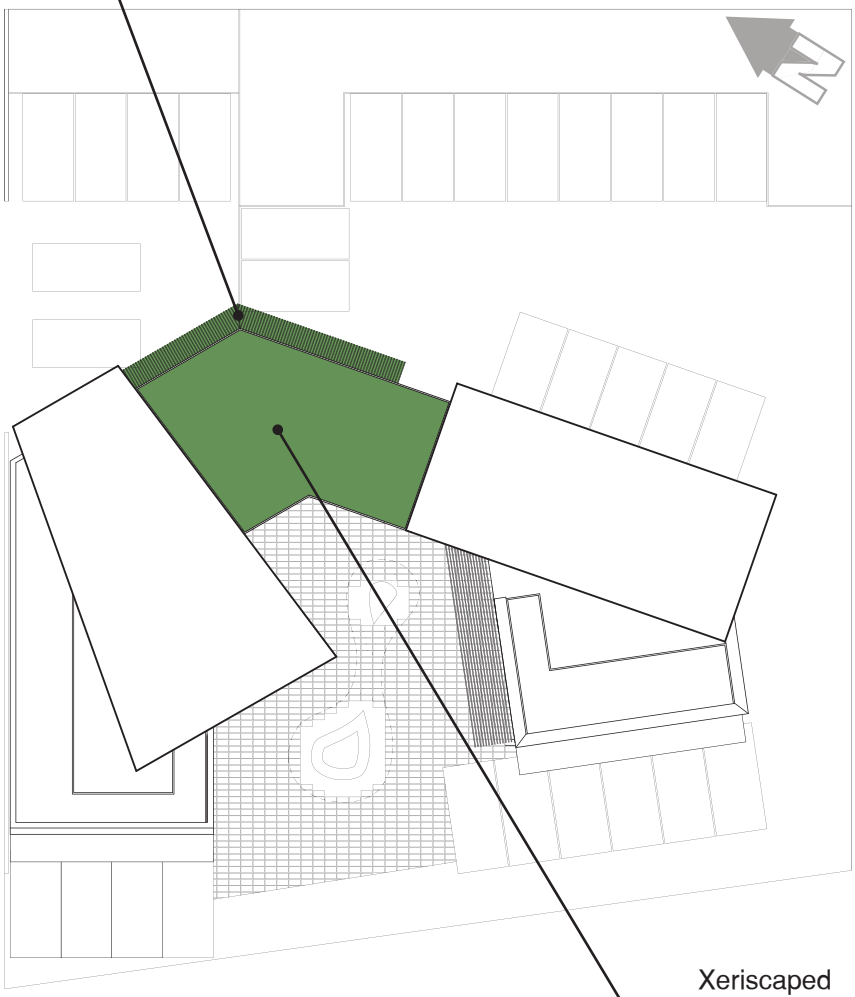
Restaurant
Garden

Image Source:
http://www.journeyetc.
com/

FIGURE 58 :: COMMERCIAL DESIGN - ROOF PLAN

Plant Screen

Image Source:
http://www.milcosolutions.
com/screening.php



Xeriscaped
Green Roof

Image Source:
http://news.yourolivebranch.
org/2012/06/22/green-roof-eye-
candy/

FIGURE 59 :: COMMERCIAL DESIGN - SECTION

5.5 Agricultural Design

The agricultural site chosen is a farm comprised of approximately 409 acres owned by the State of Hawai`i Department of Land and Natural Resources (DLNR), and leased to the University of Hawai`i as an Agricultural Experimental Station. See Figure 60 for a larger aerial view of Waimānalo with the site location and Figure 61 for a more focused aerial view. The land is comprised of six tax lots. Three of the lots, comprising 128 acres of the land, are currently in use by the University of Hawai`i under the direction of the University's College of Tropical Agriculture and Human Resources (CTAHR). This land has been an active research station for the University since being established in 1950.[236] The other three lots are a relatively new acquisition for the University of Hawai`i and are not yet in production. Prior to the University's acquisition of the land, it was leased to Meadow Gold between 1997 and 2001 for dairy operations.[237] These recently acquired lots are not going to be used in their entirety by the University. They are being subdivided to accommodate the expanding needs of the University's Experimental Station as well as providing a site for a neighboring farm that is being displaced by development. The land bordering the two new lots is owned by the Department of Hawaiian Homelands. They are planning an expansion of the existing residential lots to accommodate approximately 200 new single family residences.[238] In doing so, they would displace the Wong Farm. The new subdivision of land would allow the Wong Farm to move to new land. Figure 62 shows the existing UH Experimental Station, the newly acquired land and the proposed subdivision of the lots.

The land in Waimānalo is of critical importance for the University's research. As Oahu has urbanized, the main University campus has lost much of the space dedicated to agricultural research. The station in Waimānalo, only 19 miles away from the main

[236] Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004, 2.
[237] "Waimānalo Research Station: Master Plan, Draft Environmental Assessment", University of Hawai`i at Mānoa, College of Tropical Agriculture and Human Resources, February 2012, 1-3.
[238] "Waimānalo Research Station: Master Plan, Draft Environmental Assessment", University of Hawai`i at Mānoa, College of Tropical Agriculture and Human Resources, February 2012

campus, is close in proximity and also in possession of a significant amount of land, making it a valuable asset for agricultural research in Hawai`i. In addition, the University of Hawai`i is the only Carnegie research-intensive institution in the tropics, which means that it plays a key role in the development of models for food production and processing unique to tropical regions.[239] The population along the Pacific Rim is one of the fastest growing populations in the world,[240] and therefore the work being done in Waimānalo is vital to the development of knowledge related to the economic and environmental viability of an expanding tropical agriculture both here in Hawai`i and throughout the Pacific.

The land currently in use as the Experimental Station has been relatively the same since it was first established. A portion of the land is utilized by the federal government as a facility for the United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS), while the remainder is dedicated to research develop through the University. The University controlled land has only a few structures that act as very basic utilities, including two wooden house structures, one of which serves as a residence for the farm manager, and the other as a multi-use classroom/storage/bathroom space for visitors. There are also two Quonset huts, in severe disrepair, that act as storage for farm equipment.

Over the past decade, the University has been in the process of trying to update and expand the Experimental Station. The station has mostly been utilized by University researchers and CTAHR is hoping to broaden the scope of its usage to create more outreach programs. According to the Director for the Office of Planning and Management systems for CTAHR, Thomas Lim, the main priorities for CTAHR are threefold: Instruction, Research and Outreach.[241] Currently the school has much established for the first two priorities, and is attempting to create more opportunities

[239] Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004, 2.
[240] Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004, 2.
[241] Thomas Lim, Interview by author, Honolulu, HI, September 19, 2012.

for the third. Some outreach programs already exist, including a Master Gardeners Program, a yearly Community Field Day, and occasional workshops or events related to other organizations within Honolulu. The college would like to increase such opportunities so that it can spread agricultural knowledge and interest further into the local community. In order to facilitate these needs, the Experimental Station has been seen as an opportunity to create facilities for such community activities.

The first of such plans was put together in 2004, in collaboration with design firm Cannon Design. This master plan focused on the three tax lots that comprise the current Experimental Station. See Figure 63 for a site map of Cannon Design's Master Plan. The plan at the time was to transform the Agricultural Experimental Station into a Research and Outreach Center with the goal of becoming a "premier site for the UHM programs in tropical agriculture and human resources training where research and field application of multi-disciplinary work will be integrated to achieve environmentally sound practices for farming, agribusiness, human resource development and healthy living. The Center will house programs in research, instruction and outreach via a holistic approach to enhance agriculture, agribusiness development and quality of life."[242] The plan proposed the addition of many new buildings to house a variety of programs serving UH needs as well as community needs. Because of financial and bureaucratic constraints, this Master Plan was never executed, but still instigated the improvement process for the station.

Since that time, the University has acquired the old Meadow Gold land and is in the process of creating a new Master Plan. The Experimental Station that is in current use is well established in the community and many of the researchers familiar with the land are resistant to changing its current state. Instead, the Master Plan being developed focuses on the newly acquired land and how it will be utilized. See Figure 64 for a site map of the current Master Plan, put together in February of 2012. Much of the same principles that went into the Master Plan from 2004 are integrated into the newer

[242] Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004, 1.

Master Plan, with a more integrated look to land use management. All of the programs in the newer Master Plan are placed according to best ecological practices as well as human circulation requirements.

The commonality between the two Master Plans is in the intent of the programs to encourage more community outreach. While the current Master Plan is intended to be implemented over a 20+ year period[243] and may go through alterations during that time, it is clear through the continuity of the two Master Plans that there will at some point be a facility required for Extension Programs. Therefore, the third design experiment for this thesis will focus on this facility. In the first plan put together by Cannon Design, the program for an Extension Outreach facility was well documented. At that point, it was intended to be a facility to provide "a wide range of outreach education programs including farming practices, agribusiness management, environmental compliance, leadership development, human nutrition, food quality and safety, family financial management, and other consumer related topics."[244] The facility was to be 12,825 square feet, at the cost of $2,645,681.[245] As can be seen on the first master plan in Figure 63, the Extension Outreach Building was placed well within the site as part of a cluster of buildings. In the current Master Plan (Figure 64), the Outreach facility is not as clearly defined, nor does it have a specific building footprint outlined. In this Master Plan, community outreach is listed as Education/Extension with the stated goals of "showcasing CTAHR projects and activities, public education and technical assistance, including 4-H, Master Gardening, Community Nutrition, etc."[246] The location of the facility is part of what is called the CTAHR Education Center, seen at the intersection of Waikupanaha Street and Nonokio Street in the Master Plan in Figure 64. The facility in this Master Plan is located at the entrance to the new portion of the

[243] "Waimānalo Research Station: Master Plan, Draft Environmental Assessment", University of Hawai`i at Mānoa, College of Tropical Agriculture and Human Resources, February 2012, 1-7.
[244] Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004, 2.
[245] Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004, 10.
[246] "Waimānalo Research Station: Master Plan, Draft Environmental Assessment", University of Hawai`i at Mānoa, College of Tropical Agriculture and Human Resources, February 2012, 1-8.

Experimental Station and therefore acts as both welcome center and security point for those coming to visit and utilize the land. The design undertaken for this thesis will utilize aspects from both of these Master Plans in its conception. To stay true to the most current Master Plan, the location for the facility will be at the new entrance to the property and act as both educational facility as well as a welcome center for visitors. See Figure 65 for an environmental site plan of the proposed building site. The program for the design utilized information from both Master Plans. The initial Master Plan provided detailed spatial needs to include:

Administrator Office:	200sf
Administrative general office Area:	500sf
Administrative Workroom:	200sf
Reception/Resource Area:	200sf
Storage Room:	250sf
15 Faculty Offices:	140sf/office
5 Faculty Workrooms:	150sf/workroom
30 Workstations:	100sf/station
Large Conference/Classroom:	800sf
Small Conference/Classroom:	400sf
Small catering Kitchen:	150sf[247]

The second Master Plan, which does not include a detailed program such as this, is consistent with the first plan in that it specifies the need for 15 Faculty Offices and workstations for 2 graduate students per faculty member, equaling the same number of workstations as listed in the first Master Plan. The differences in the second Master Plan are some additional programs that are combined with the spaces listed above for this thesis's design, including:

Multi-media auditorium
Demonstration Lab
Cafeteria[248]

[247] Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004.
[248] "Waimānalo Research Station: Master Plan, Draft Environmental Assessment", University of Hawai`i at Mānoa, College of Tropical Agriculture and Human Resources, February 2012.

The design for a significantly sized structure on agricultural land necessitated an idea for how to minimize the footprint of the building, environmentally and visually. In order to achieve this, the design, seen in the renderings in Figures 66 and 67, was envisioned as a part of the hillside. The site is located at the point in topography where the land begins to rise, slowly at first and then sharply, into the dramatic wall of the Ko`olau Mountains. The Outreach Center is nestled into the hillside, just as this rise begins. The building is essentially two large volumes made with basic steel bent arches typical to warehouse construction, with a large superstructure holding a green roof that slopes directly into the hillside. The building site cuts into the organic contours of the land with strong geometry, a circle delineating the parking area, and the two lines of the roof edges intersecting the circle. See Figure 68 for a site plan with the relationship of the building to the street and the topography.

The front of the building, opening onto the circular parking plaza, is a two-story slanted curtain wall, allowing natural light to wash through the interior and creating an extensive atrium interiorscape along the front of the building. From this angle, the building presents a modern and sleek look, with glass and metal framing creating a contemporary greenhouse effect. From every other angle, the building simply melts into the mountain.

The rear of the building, buried into the hillside, opens to the landscape with an amphitheater space that arises from the building within the ground and meets the landscape's sloping topography. The amphitheater is bordered by lava rock walls and covered with an array of twisting fabric membrane structures that act as a shade device for the amphitheater. From this rear perspective, the extent of the building is not visible at only. One only sees the lava rock walls growing out of the land, holding light fabric elements, the only white among an expanse of green. The levels of the amphitheater, large grass stairs edged with stone, seem to lead one into a hidden cove as they step downward into the building within the hillside.

The organization of interior spaces is arranged to accommodate the various privacy and security needs dictated by the program. A bubble diagram seen in Figure 69 lays out the necessary spaces and the flow of public to private. This range is achieved by separating the main spaces for Outreach programs with the spaces for UH staff and students to different floors. Please see Figures 70 and 71 for floorplans of the building.

The first floor contains the most public spaces, including the lobby and demonstration lab. This area is the main entry to the circulation flow for the building and is open to all. It acts as a welcome point for researchers, students and visitors. The extensive lobby space doubles as a demonstration lab. Islands of landscape are arranged around the lobby floor, displaying living examples of the facility's research projects. They act as pockets of educational landscaping that celebrate the purpose for the facility in the most prominent and frequented space in the building. The first floor then branches in three directions. One side of the building is an eating area, with a cafeteria and seating for approximately 100 people. The other is the main administrative area and classroom space for the station's outreach programs. Leading straight off of the main entry is the auditorium. The auditorium is designed as a transitional space, with a retractable wall along the back of the building that can keep the auditorium enclosed and small for more intimate gathering needs, or be opened to the exterior amphitheater for larger gatherings. This enables the space to provide for more day-to-day meeting needs as well as accommodate the infrequent large gathering needs for the facility, such as Community Field Days.

The second floor is devoted to the use of UH faculty and students. It is an open floorplan of student workstations and communal gathering spaces with faculty offices rimming the edges. The second floor does not reach all the way to the curtain wall. A rail is set up along the front edge of the floor which keeps a visual connection possible to the first floor. Natural light from the extensive curtain wall is then able to penetrate all along the second floor and the greenery in the atrium space below is still visible. There are also full length window walls that look down onto the auditorium space

below. This allows another angle of view for presentations happening in the auditorium, as well as another point of entry for natural light to penetrate the interior.

The landscaped architectural moments in the building are designed with two intents in mind: minimizing the visual and environmental impact of the building, and creating a comfortable learning and work environment for staff, students, and visitors. This is achieved through four main landscaped architectural features: the green roof, the atrium interiorscape, the island beds in the demonstration lab, and the garden amphitheater. Their purposes will be analyzed using the seven landscaped architectural guidelines.

Transparency Equals Awareness:

The transparency of the local environment is instantly evident with this design. The building itself disappears into the hillside, with an extensive green roof jutting out, proclaiming the mountain's prominence. It is a visual manifestation of the importance of the land embodied in the architecture.

The extensive green roof also provides a platform for research that is prominently displayed to all visitors to the site. The area all around the building is designated as the research zone for floriculture – the cultivation of flowering and ornamental plants.[249] This research can continue right onto the roof of the building, with researchers investigating the viability of various plants for green roof applications. For this design, both the human purpose for the building and the local landscape are fully integrated into the architectural design forcing a level of awareness for inhabitants.

[249] Random House Dictionary, s.v. "floriculture", www.dictionary.com (accessed November 9, 2012).

Architecture as a Journey:

Again with this design, the experience of the architecture maintains constant contact with landscaped moments so that inhabitants' senses are continually stimulated by natural elements. The main entry to the building has both landscaped islands and extensive interiorscapes that help direct the flow of movement as well as present various sensory experiences. Even from the second floor, the curtain wall allows a continual view of the outdoor as well as a connection to the interiorscape in the atrium below.

The use of landscaped elements also provides a flow through the building with the use of the amphitheater. People can walk from exterior to interior and out through the stepped terraces of the amphitheater onto the hillside. It provides an interesting combination of experiences that present different ways for inhabitants to engage with landscaping – from highly controlled to wholly natural, as well as educational to aesthetic.

Retreat:

The notion of a retreat is treated slightly differently in this design because of the use of the building. The use of landscaping as a retreat element is designed to create a pleasant learning and work environment. The main way this is achieved is with an integrated atrium interiorscape that reaches the entire length of the building, visible from both floors. This interior landscaping helps to create a retreat type feeling within the building. In contrast to the stark feeling of a typical institutional building, the greenery creates a more aesthetically stimulating environment. The plants literally bring the interior space alive, soothing and refreshing the eyes and softening the interior so that those stuck indoors for long workdays still have access to the beauty of nature. The constant interaction with living elements helps create a productive, happy work environment.

Utility:

The most prominent feature, the extensive green roof, acts as both stormwater maintenance as well as an insulative entity that lowers energy demands for space conditioning. This insulative quality is also enhanced by the building's position in the hillside. The earth acts as a large thermal mass that helps regulate the temperature variations in the building, drastically lessening the space conditioning requirements.

From an ecological perspective, the extensive green roof also offsets the footprint of the building and provides habitat for local wildlife. Unlike typical green roofs that are separate from the ground and are therefore isolated, manufactured environments, this green roof is attached to the ground, allowing various wildlife to simply migrate onto the roof space. It is an interesting variation of the green roof that potentially allows for a greater interaction with local ecosystems.

The atmospheric quality in the interior of the building is also enhanced by the large atrium interiorscape. The many plants that are useful for their aesthetic appeal also have the utilitarian quality of purifying the air, keeping a constant circulation of fresh air for the building's inhabitants.

Boundary:

In this design, the use of landscaping elements to delineate a boundary is purposefully blurred. The garden amphitheater, made of grassy steps bordered with stone, start to transition the raw landscape into built environment. It blends the exterior into interior and hill into building through architectural plateaus and shading devices – all psychological cues that a border is being crossed from nature into architecture.

Alternatively, the strong geometry of the parking area and roofline are sharper boundaries that speak to the hand of man shaping nature. Each of these lines are similarly blurred using natural materials. The walls of the parking area are made with locally available lava rock, while the roofline is abounding with plant life. Even in the moments where the architectural line is declared most prominently, the boundary of nature and architecture is eased with the landscaped elements. In a site where the land is the most significant aspect, boundaries are maintained subtly.

Education as Aesthetic:

The facility as a whole is an educational resource and therefore the architecture includes landscaped elements that reinforce this purpose. The main entry to the building is peppered with landscape islands that showcase the research untaken on the grounds of the station. They act as demonstrations that illuminate the innovations and discoveries being untaken in the fields of agriculture, botany, ecology, forestry, and any other field utilizing the land. They celebrate the academic achievements being undertaken at the experimental station by situating them into neat, aesthetic frameworks presented to every visitor to the building. They are pedagogical tools as well as aesthetic moments that enhance the entry experience to the building.

Framing Nature to Redefine Beauty:

The overall concept of nestling the building into the hillside is a mechanism for framing the dramatic beauty of the Ko`olau mountain range. Instead of creating a building that sits on top of the hill, simply looking upon the majestic walls of the range, the building encourages a greater connection to the natural topography. Utilizing the 'stratum' style of landscaped architecture, the building bends the ground plane to reveal an architectural fissure. The striking contrast of the contemporary curtain wall peeking

out from the hillside allows the organic form of the natural landscaping to become the literal framework for the building. The hand of man emerges with nature's forms, creating a visual symbiosis of hill and architecture that exemplifies the beauty of both.

Summary :

The need for an educational facility on agricultural land is an interesting design challenge that calls for a sensitive integration of architecture with site. It must maintain a small visual and environmental impact so that it does not impede nor contradict the goals of the facility. While still enabling a happy, thriving work environment for both the school and the community. This research station is an essential established resource for the progress of tropical agricultural knowledge in Waimānalo, but also for Hawai`i and for the greater Pacific region. The integration of a landscaped architecture is especially pertinent in this circumstance and presents an opportunity for an example to be made. This new facility can embody the old ideals, which have little regard for the environment, or it can choose to embody the principles of the future – sustainability.

FIGURE 60 :: AGRICULTURAL SITE SELECTION

Image Source: earth.google.com/

FIGURE 61 :: AGRICULTURAL SITE LOCATION

Image Source: earth.google.com/

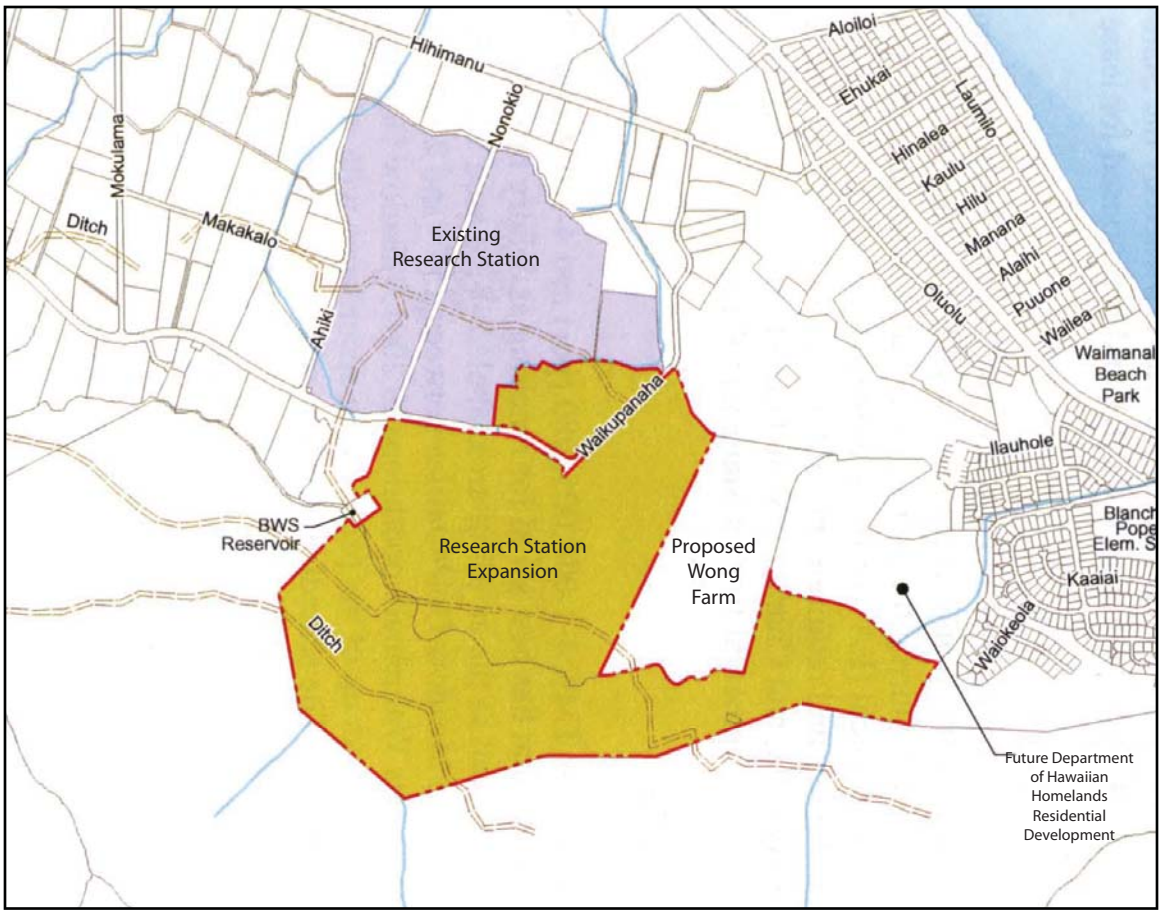


FIGURE 62 :: WAIMĀNALO RESEARCH STATION - OVERVIEW

Image Source: "Waimānalo Research Station: Master Plan, Draft Environmental Assessment", University of Hawai`i at Mānoa, College of Tropical Agriculture and Human Resources, February 2012

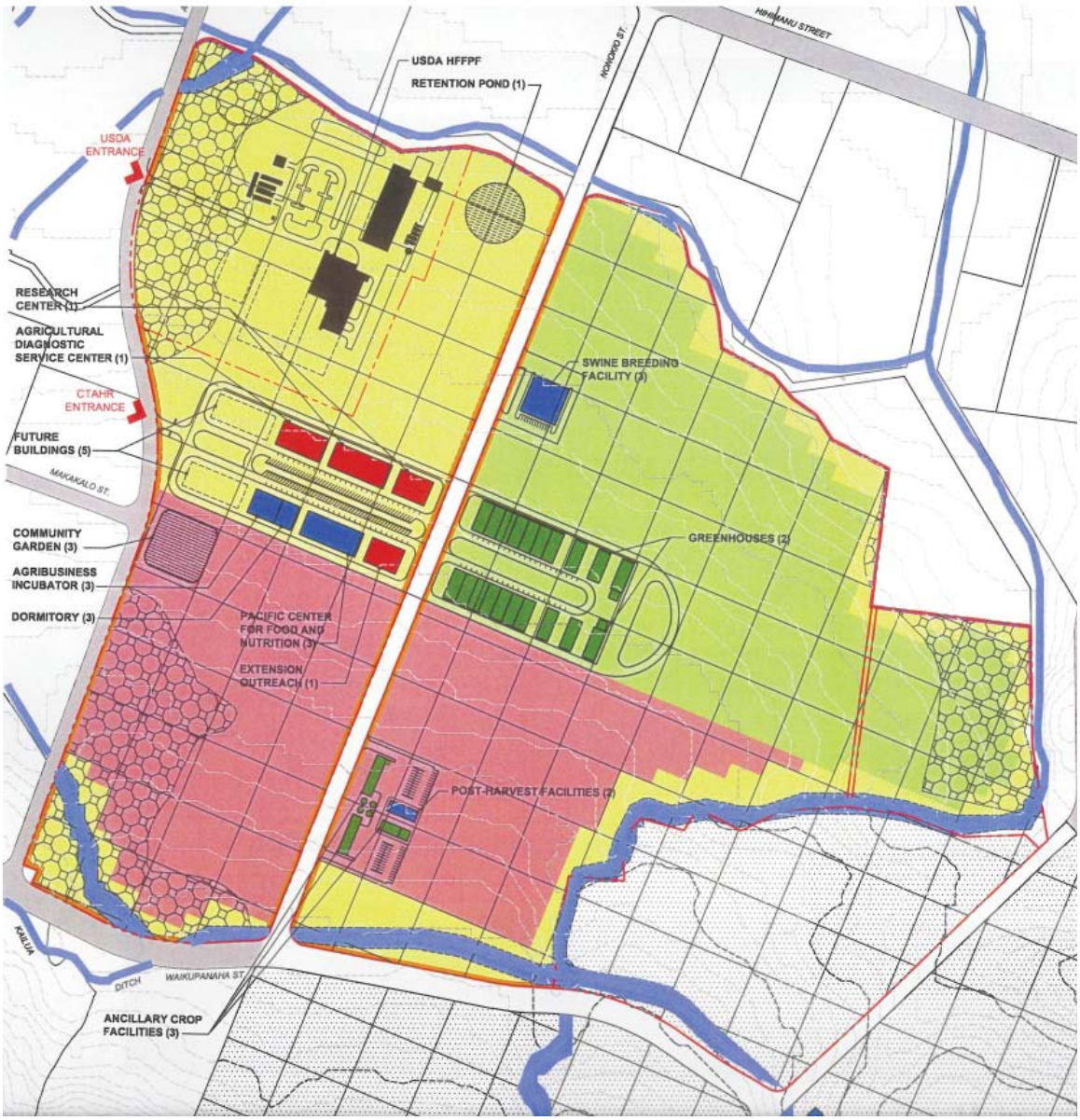


FIGURE 63 :: WAIMĀNALO STATION MASTER PLAN - 2004

Image Source: Cannon Design, "University of Hawai`i at Manoa, College of Tropical Agriculture and Human Resources, Waimanalo Research and Outreach Center Master Plan", June 1, 2004

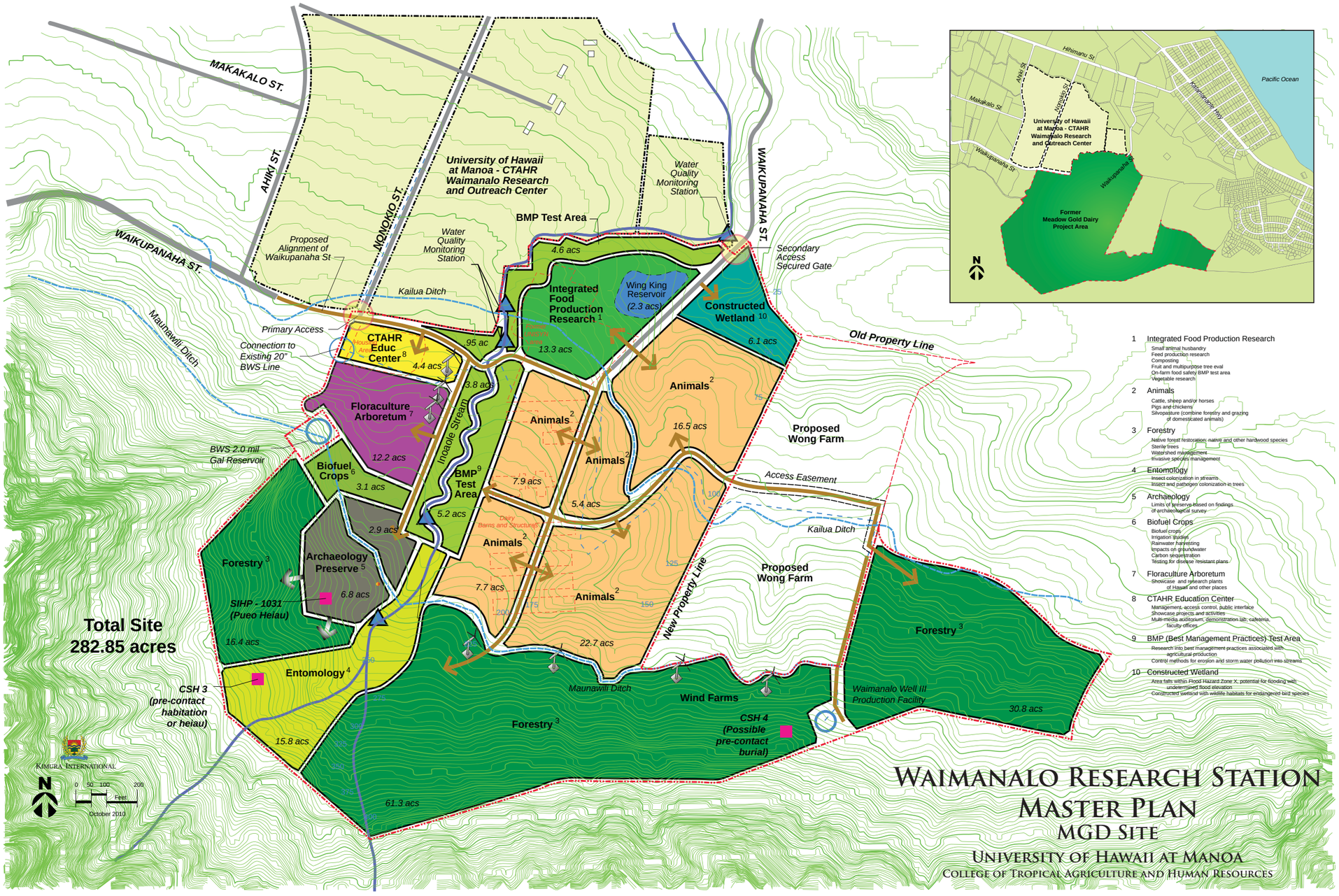
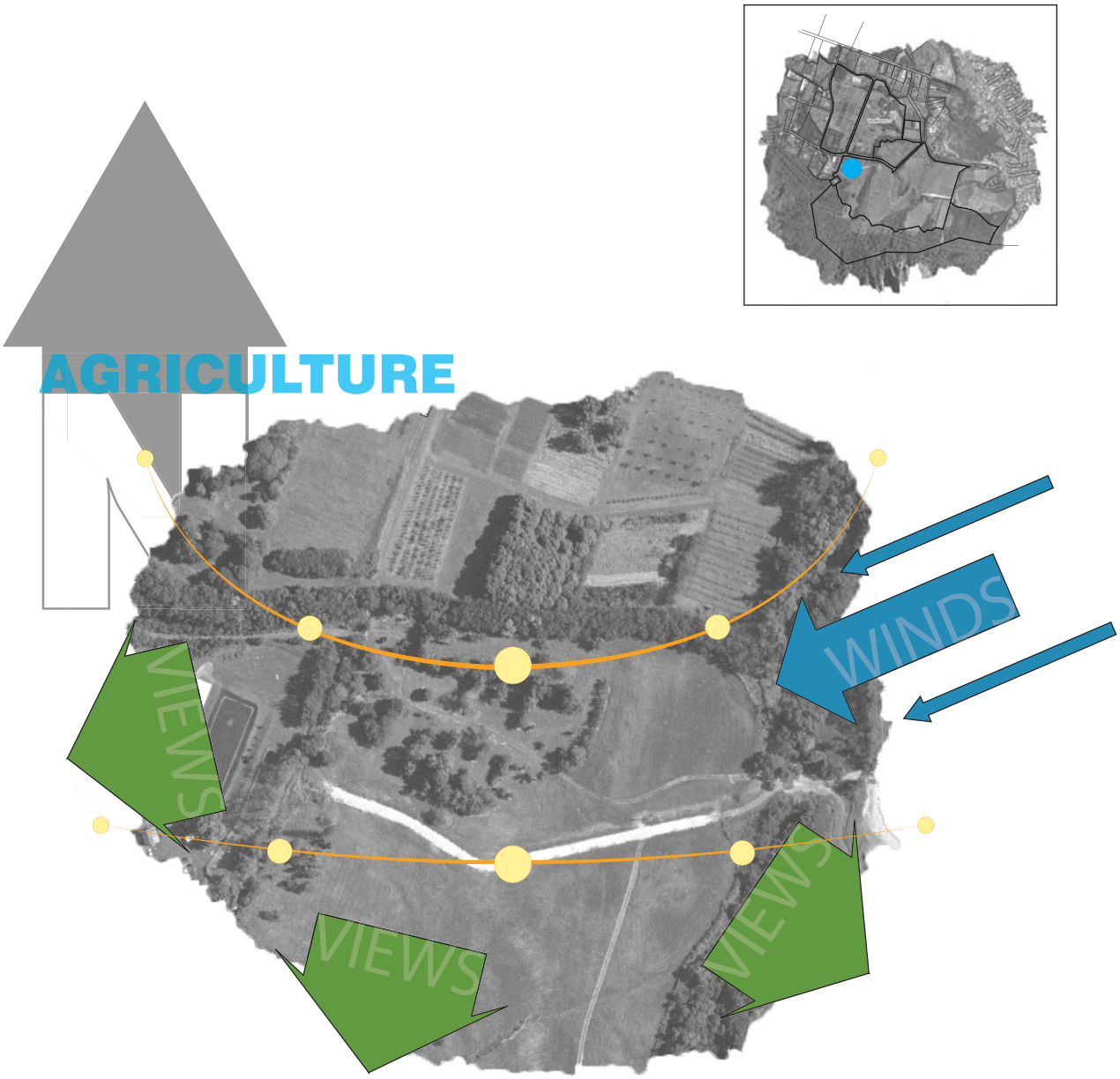


FIGURE 64 :: WAIMĀNALO STATION MASTER PLAN : 2012

Image Source: "Waimānalo Research Station: Master Plan, Draft Environmental Assessment", University of Hawai`i at Mānoa, College of Tropical Agriculture and Human Resources, February 2012, 1-3.



RAINFALL :: 45 - 55”

PRIME AGRICULTURAL LAND

ELEVATION :: 40 - 120’ ASL

STATE LAND USE :: AGRICULTURE

ZONING :: AG-2

FIGURE 65 ::AGRICULTURAL SITE - ENVIRONMENTAL SITE PLAN

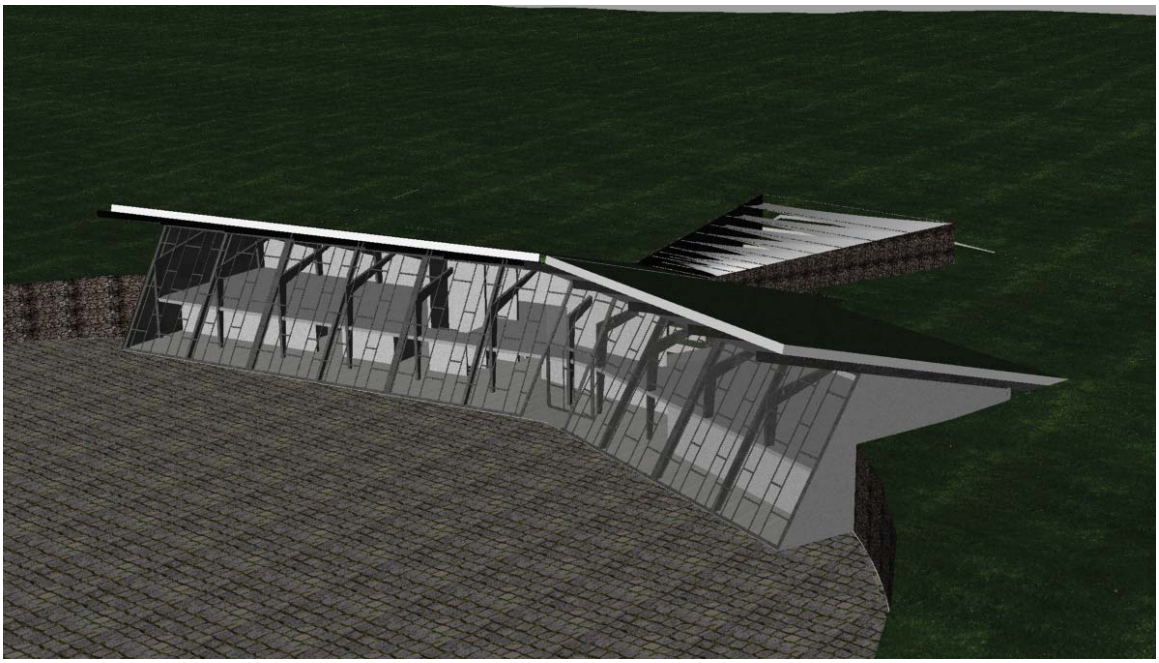


FIGURE 66 :: AGRICULTURAL DESIGN RENDERING - FRONT

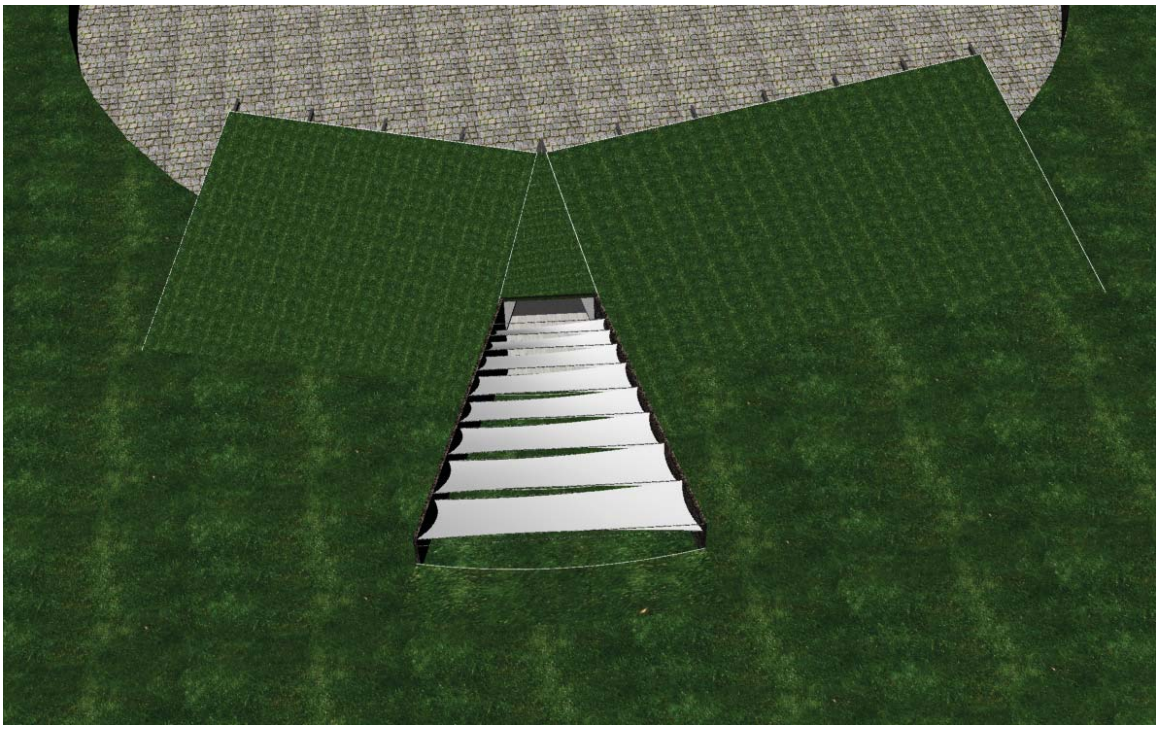
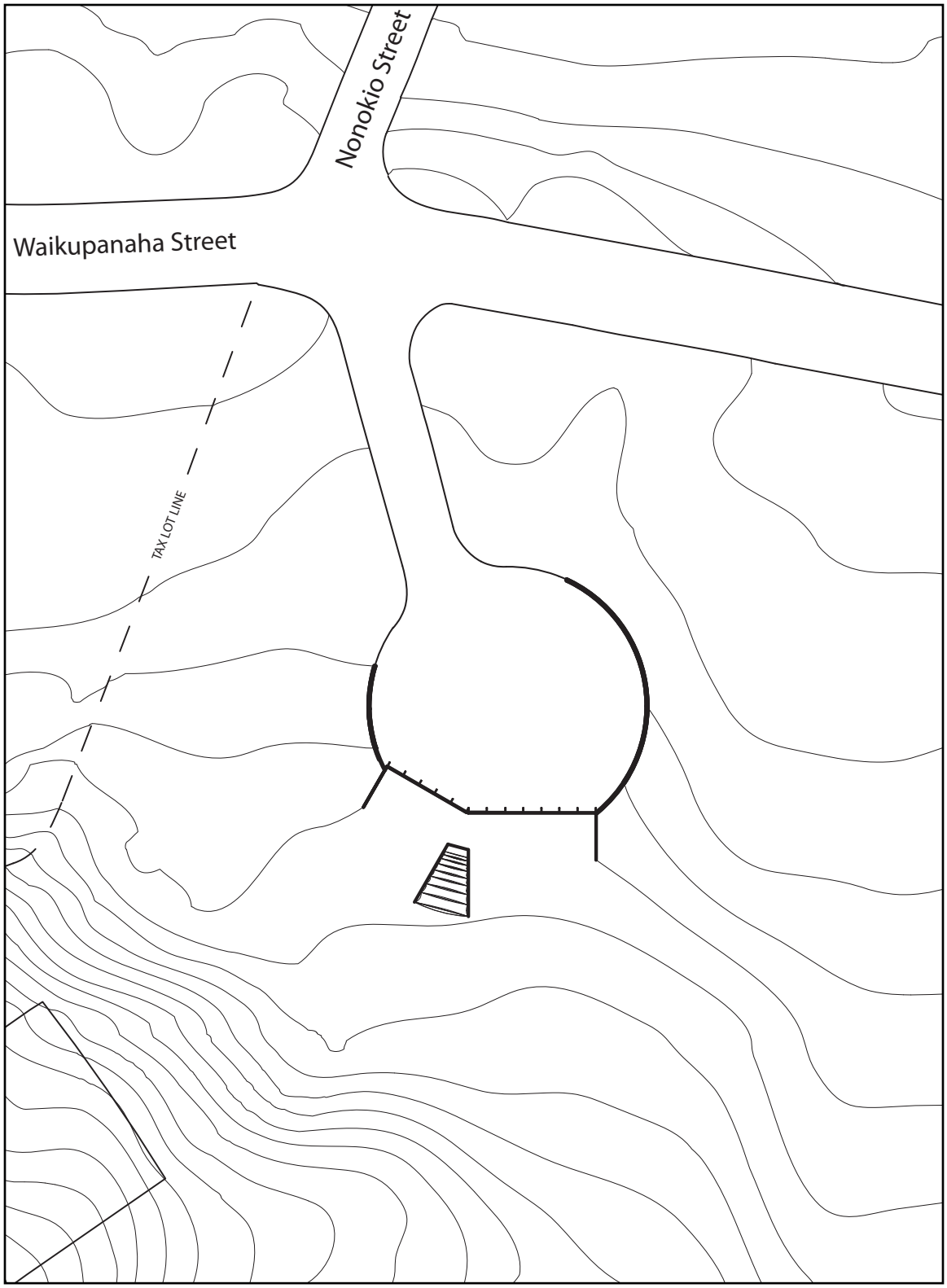


FIGURE 67 :: AGRICULTURAL DESIGN RENDERING - AERIAL

FIGURE 68 :: AGRICULTURAL DESIGN - SITE PLAN



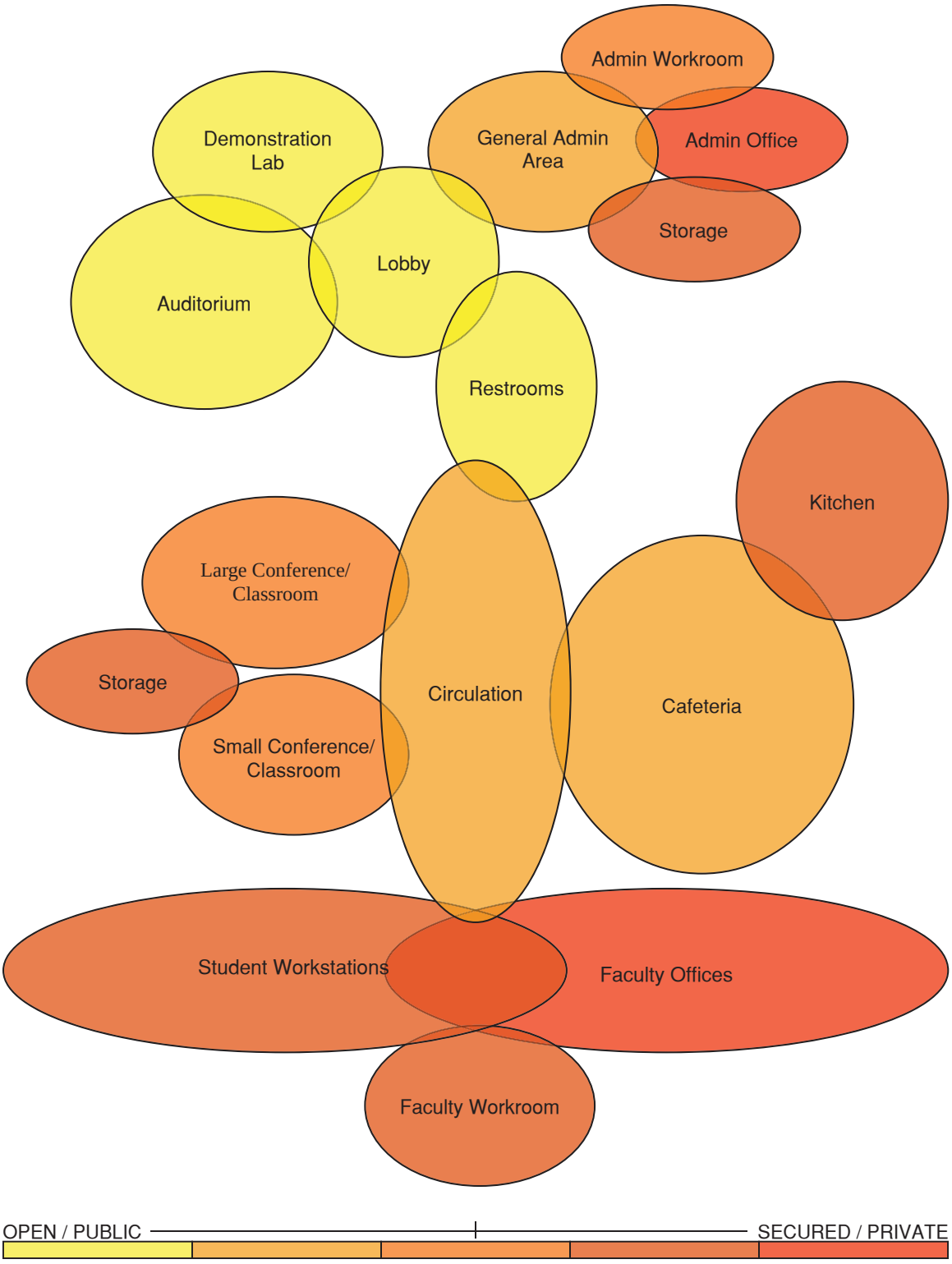


FIGURE 69 :: OUTREACH CENTER - SPATIAL ORGANIZATION

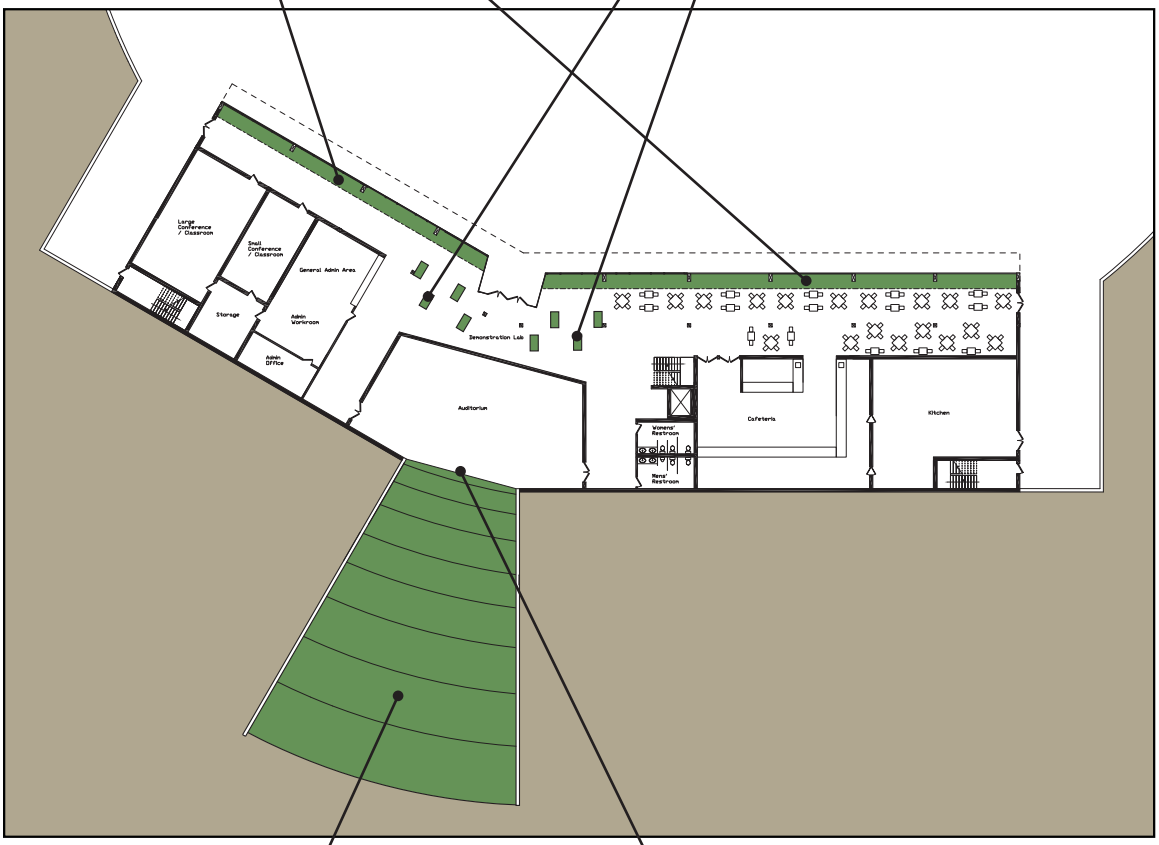
FIGURE 70 :: AGRICULTURAL DESIGN - FIRST FLOOR PLAN

Atrium
Interiorscape

Image Source:
http://www.southfieldtown-center.com/meetings.html

Landscape
Islands

Image Source:
http://en.wikipedia.org/wiki/File:Living_Machine_at_Port_of_Portland-interior.jpg



Garden
Ampitheater

Image Source:
http://www.home-designing.com/2009/08/serene-home-in-the-forest

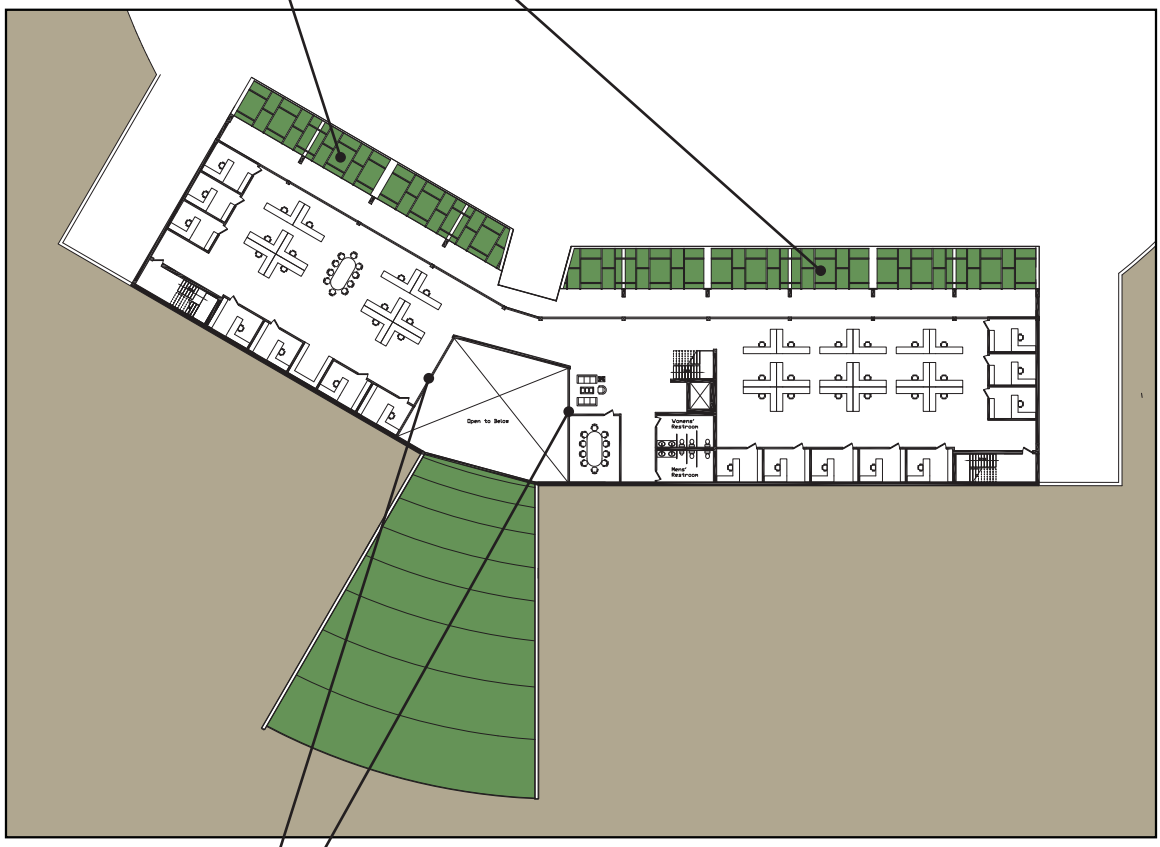
Retractable Wall

Image Source:
http://skyfold.com/media/gallery/Skyfold_mirage_cherry_hill_2.jpg

FIGURE 71 :: AGRICULTURAL DESIGN - SECOND FLOOR PLAN

Atrium
Interiorscape

Image Source:
http://www.southfieldtown-center.com/meetings.html



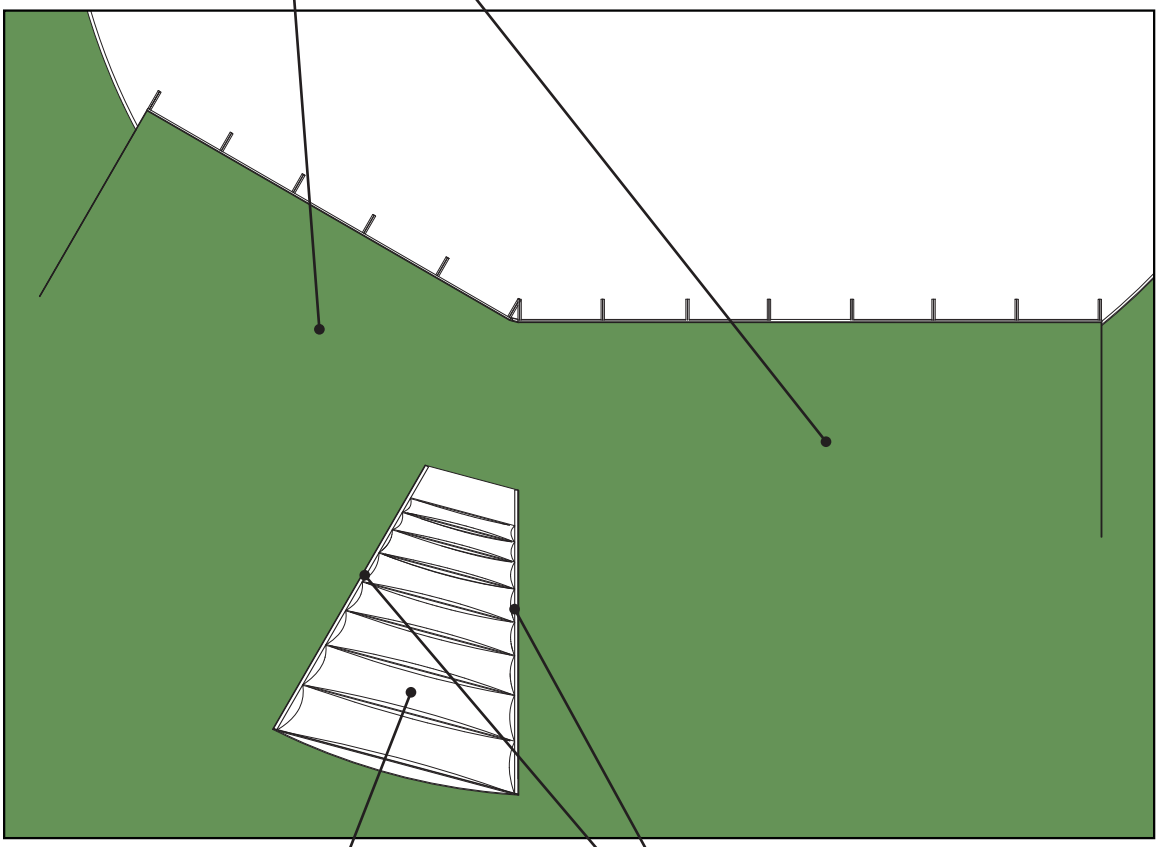
Windows to
Auditorium

Image Source:
http://www.news-gazette.com/multimedia/photogallery/

FIGURE 72 :: AGRICULTURAL DESIGN - ROOF PLAN

Stratum : Green Roof

Image Source:
http://design5aw.blogspot.com/2012/05/green-rooffacade.html



Fabric Membrane Shading

Image Source:
http://fabricarchitecturemag.com/

Lava Rock Walls

Image Source:
http://www.chrisorwig.com/today/index.php?showimage=615

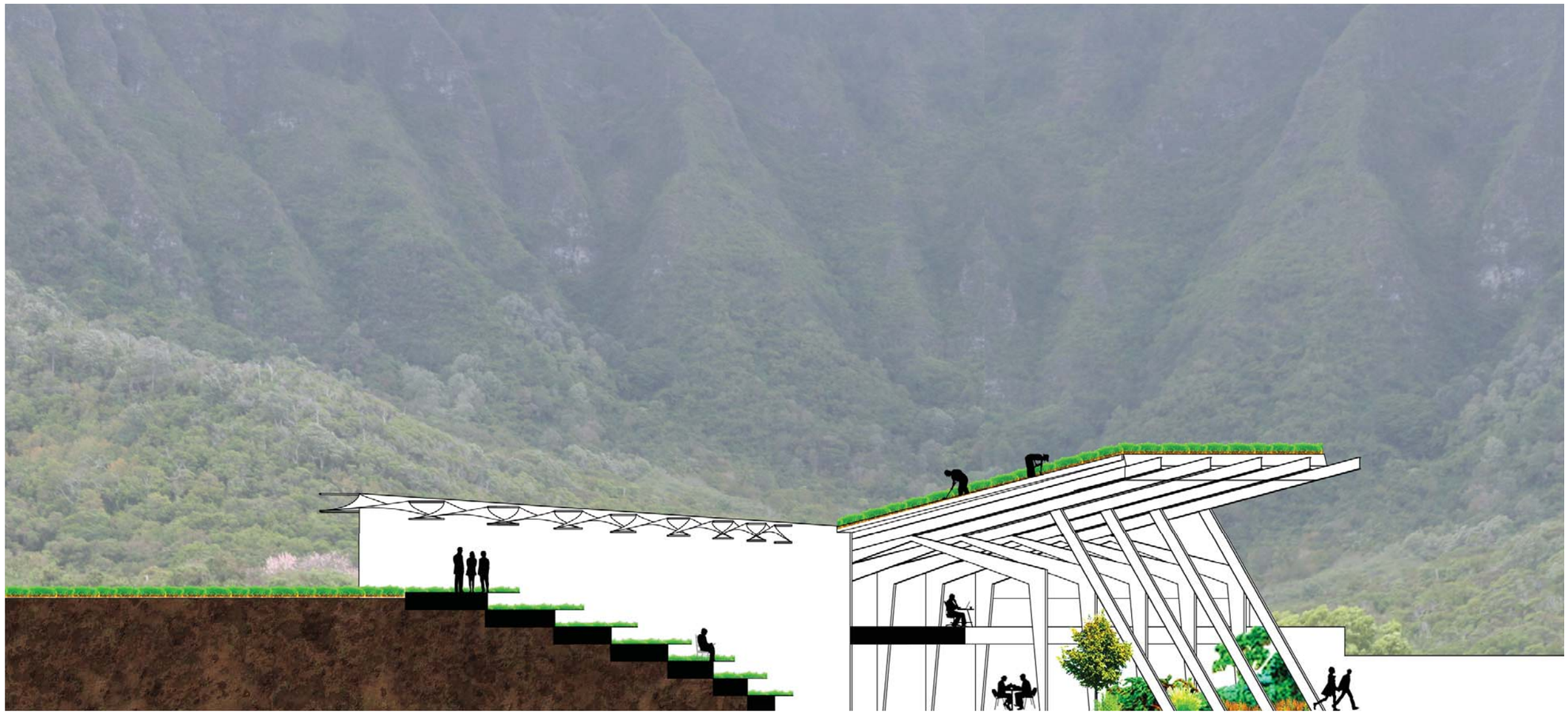


FIGURE 73 :: AGRICULTURAL DESIGN - SECTION

Design Summary

The issues surrounding the creeping development in Waimānalo are common problems facing society in Hawai`i and across the globe. They serve as constant local reminders that the sustainability movement has a long way to go before solutions are developed that support modern human civilization without degrading the environment that supports it. While Waimānalo is an example of how sustainability issues pertain to an agricultural community facing urban sprawl, the same issues are relevant in every type of community - from the most rural to the most urban. The changes inherent to an increase in population and its corresponding development necessitate revised architectural solutions on all scales. As our population increases and modernizes, building strategies become increasingly technical and controlled. More and more, humans are working and living in skyscrapers, midrise buildings, or sterile suburban expanses. The human landscape is increasingly becoming a series of sealed, isolated compartments while landscaping has been relegated to strictly regulated plots and pockets. This type of manufactured environment will continue to expand unless there is a new vision for design. The progressive separation of mankind from the natural environment has created a modern existence desperately in need of reconnection with nature for the health of the environment and mankind. Landscaped architecture provides a new design language that has the potential to respond to these issues in the current built environment.

CONCLUSION

The built environment of modern civilization is in dire need of reconnection with nature. Environmentalism has been building in significance and has now created a wave of momentum for the integration of sustainability principles into design and production processes. In contemporary architectural design, the response to this global push towards sustainability is through an increased awareness of ecological concerns, being manifested in a worldwide design language increasing the usage of landscaping as an integrated component of the built environment. This new design paradigm is discovering ways in which landscaping is redefined to fit within, on and around built spaces in order to intertwine the natural world within the built world and allow for a fuller interaction between human and nature, at once more intimate and more holistic. It is a closer connection of the manmade world and the natural world where landscape and architecture are no longer separate, but rather weave together into a landscaped architecture. The question for this thesis has been, is this contemporary design language, ostensibly based on a rising environmentalist movement, actually solving the issues behind sustainability, or is this simply a momentary trend in architectural history? Is the literal 'greening of a building' presenting solutions that can create a lasting effect on how we design and construct the built environment?

To examine this question, the potential for a landscaped architecture was analyzed using three major drivers for successful architecture: function, form and meaning. Each of these broad goals of architectural design represent an essential component to the success or failure of a building, both in its initial intended use as well as how it stands the test of time. A true masterpiece of architecture is able to balance the three, so that a building will function, spatially and mechanically, while also creating a beautiful statement, both formally and as a testimonial for the values and goals of a culture in its time and place. If landscaped architecture is to last as a significant design

movement in architectural history, it must be able to address these fundamentals of exceptional architecture.

Examining the functional potential for landscaped architecture is perhaps the most obvious and well-researched of the three principle goals of architecture. The sustainability movement has been founded on, and propelled by, an integration of ecological thinking, both as a theoretical foundation and as scientifically based strategies for utilizing natural elements and natural processes for the systems within a building. There are natural systems that can catch and purify water, cool and purify the air, insulate the interior, remediate polluted land, as well as provide food, medicine and shelter. Each of these broader mechanical requirements in the human built environment are being addressed in any number of creative ways by researching and using strategies found in nature. More and more, designers are finding ways in which the complex systems found in nature can be integrated into a building's systems to solve human needs. So, to begin to answer the question of landscaped architecture's relevance as the environmentalist design language, it is obvious that it has the potential to address the first of the three fundamentals of architecture. Landscaped architecture can fulfill sustainable functional needs within the built environment by supplementing or replacing the mechanical needs of a building.

The second main driver of architecture to be analyzed was the question of form – aesthetics. This particular of architecture is less easy to pinpoint because aesthetic value can range so greatly from person to person and culture to culture. To investigate this essential but variable aspect of architecture, aesthetics were broken into two veins: instinctual and intellectual. The study of aesthetics is the study of how humans interpret the world in which they live, through the five senses and also through the mental processes that categorize and judge sensory intake. Aesthetic value is then a balance of these two human ways of interpreting the world: an emotional, instinctual reaction to the information coming from the senses; and an intellectual interpretation of this input based on a developed or learned cultural value system. To judge the

potential for aesthetic value in landscaped architecture, both aspects of aesthetic interpretation were analyzed.

From the instinctual perspective, there is a growing body of research that is being developed around the important but often undervalued relationship of mankind to nature. Based on the biophilia hypothesis, which states that humans are innately attracted to other living things, a number of studies have been undertaken that are creating a strong correlation between an increase in the health and happiness of a building's occupants and regular contact with nature. Access to natural elements resulted in environments where employees worked more efficiently and were absent less, hospital patients healed faster, consumers shopped more, and communities had lower crime rates – all suggesting an increase in well-being. What these studies are illustrating is the basic guttural human reality that nature is appealing. Perhaps more importantly for design professionals, the aesthetic value of natural elements can drastically affect emotional and physical health. From this perspective, the question of the instinctual aesthetic value of landscaped architecture is addressed. Landscaped architecture has the ability to improve occupant well-being by creating a more pleasing and healthy environment.

The intellectual aspect of aesthetic value is related to the dominant value system of a time and place. Humans have always sought to represent an ideology in their creations. Every piece of architecture is a standing legacy of the cognitive processes of the creator. The aesthetic value represented in the current architectural landscape is dominated by the ideology of modernism and the aesthetic of 'form follows function'. It is an aesthetic ideal where a purity of form is sought by eliminating all decoration and celebrating the truth of materials by revealing the function of the structure. However, the legacy of this intellectually valued aesthetic is no longer representative of the increasingly dominant ideology of the time – environmentalism. Purely modernist structures are conceived as an 'object in the landscape', which is a very resource dependant style of construction; certainly far from sustainable. The environmentalist

ideology is concerned with a greater connection between the built environment and the natural environment. The landscaped architecture examples that are popping up around the globe are far more representative of this ideology. It is a contemporary design language arising out of the intellectual foundation of environmentalism in a stimulating new way. Landscaping is being integrated within architecture in a highly designed and visually striking manner. The fact that it is more representative of the values current to contemporary civilization as well as done in a progressive aesthetic form enables landscaped architecture to carry the aesthetic worth related to intellectual valuation. In terms of how this affects the relevancy of landscaped architecture as the design language of environmentalism, it is absolutely pertinent because of the important connection between consumer demand and the success or failure of an idea. If an idea is packaged in an aesthetically pleasing manner, tapping into the idealized intellectual aesthetic of the time, the consumer demand will result in more options, at cheaper prices, with greater proliferation throughout society. For the sustainability movement, this means that landscaped architecture has the ability to create a level of aesthetic desirability that may generate a wave of demand necessary to normalize sustainability infrastructure, enabling sustainable strategies and products to become accessible to more people and to permeate throughout the built environment.

The last of the three fundamental principles for architecture is perhaps the most important for the longevity of a building – the meaning behind the design. Architecture is a monument to the values of a culture in its time in history. Those buildings which are able to embody the values and goals of a culture and to resonate a deep sense of place are the buildings that are loved and that stand the test of time. To analyze the potential of landscaped architecture for this critical aspect of architectural design, Hawai`i was used as a specific location and cultural lens.

Through historic research of the islands, it is evident that there has always been, and continues to be a strong connection between the Hawaiian landscape and both its culture and its architecture. The isolation of the Hawaiian islands has meant that every

culture that has come to the islands has literally shaped the landscape through the plants introduced and the land management patterns adopted. Hawai`i today, both in its culture and in its landscape, is a unique blend of the many cultures that have settled on the islands. Each part of that history has been marked by a strong connection between the land and the culture. The ancient Hawaiians were deeply reliant on the land for survival and therefore the design and orientation of land-use and architecture was intimately related to the patterns of the land. Then, as various foreign cultures arrived on the island with imported plants and styles, the landscape changed drastically. Still, the tropical landscape continued to define the modernizing Hawaiian culture. In this era of blending cultures, the landscape was used as a mechanism to mediate between the raw natural beauty of the islands and the imported architectural styles –as a way to 'Hawaiianize' the foreign typologies. In modernity, the blending of cultures evolved into something uniquely Hawaiian, and still the landscape was strongly linked to the identity of the culture. This is certainly true for Hawaiian architecture. In the discussion of a modern Hawaiian architectural space, the most essential aspect is the fluid relationship of interior to exterior. The weaving of landscape and architecture is essential in this articulation. In contemporary Hawaiian culture, there has been a renaissance of ancient Hawaiian traditions, which has only enriched the relationship of culture and landscape. This can be seen in the proliferation of native and ethnobotanical gardens, the continued efforts to remove or isolate invasive species while simultaneously cultivating native species, and in the resurgence in utilizing traditional land-use strategies such as the ahupua`a.

As an example for landscaped architecture's potential to embody cultural values and goals, Hawai`i proves how intimately cultural identity is tied to landscape and how those values can and are inherently woven into local architecture. While every location and culture will have a different historical relationship of culture and landscape, the same truth applies – local landscape and local ecology are an intrinsic part of what defines a sense of place. In this way, landscaped architecture has the ability to

represent cultural significance by encouraging the local sense of place that is inherent when utilizing regional ecological materials, plants and ethnobotanical references.

By analyzing the capability of landscaped architecture to address the three fundamental requirements for good architecture, it is clear that landscaped architecture has a great potential as a design language to embody the environmentalist movement for architecture: functionally, formally, and culturally. However, every design language has the ability for greatness and the possibility of catastrophe. In order for landscaped architecture to succeed as a design movement, both in the creation of great architecture as well as truly reaching the goals of sustainability, strategies were identified to help guide architects in the pursuit of this style of design.

The first step for outlining design strategies for designers was to simply identify the ways in which landscaped architecture is already happening. The landscaped architectural design articulations discussed- interiorscapes, green roofs, vertical gardens, the stratified ground plane, grown architecture, living machines, and communicative architecture – represent the beginning of this new era of design. Each negotiates the integration of natural elements within the built environment in an exciting new way, with various levels of success. The global architectural community is in the beginning stages of these expressions, and so we may look to these examples as the prototypes of things to come and learn from their successes and failures. Outlining these specific formal explorations of landscape's integration with architecture creates a framework for how this design language is manifested and provides a source of inspiration for future landscaped architectural designs.

A second level of strategy identification looks at the underlying theoretical motivations for landscaped architectural elements. These guidelines provide a conceptual underpinning for the ways in which specific landscaped architectural elements may respond to various goals of sustainable architecture. Seven guidelines for utilizing natural elements were: promoting transparency as a mechanism for creating awareness, defining the experience of architecture by creating a sensory journey,

establishing a place of retreat, providing utilitarian benefit by replacing mechanical needs in the building, outlining psychological and physical boundaries, supplying an interactive pedagogical space for ecological and sustainable concepts, and framing nature in ways that help redefine beauty. Each of these strategies can be used in isolation or in combination to address the needs of a design challenge. The most successful, however, are those that utilize landscaped architectural elements not as simply additive, but as integrated design solutions that address multiple needs. These landscaped statements can be large or small, incorporated into any aesthetic style of architecture, or any range of design requirement.

What this thesis has primarily been concerned with is the potential of the landscaped architecture design language to embody the goals of environmentalism and to also create architecture that will stand the test of time as useful and loved buildings. Through analysis it is clear that the potential is certainly there. This, however, does not necessarily mean that landscaped architecture will actually endure and prove to be more than a trend. There are a number of real world practicalities that may impede the longevity of landscaped architecture as a design language. The shift that needs to happen for landscaped architecture to carry on is twofold, it must truly fulfill the goals of sustainability, and it must become seen as manifestly inherent to sustainable design.

There are difficulties for this transition to happen and may potentially create barriers too strong for these expressions to last in the long term for architectural expression. First and foremost is the inability to create modular systems that can be sold globally, as much of our current construction methodology demands. If each building is sited and designed specifically to respond to the local ecosystem within which it exists, each site must then be specifically tailored to that site's unique set of circumstances. There is no panacea that can come from the current globalized manufacturing system based on the mass-production of single solutions. There are almost as many solutions that exist for the unification of architecture and landscape as there are landscapes in the world. However, customization is not necessarily something

that is unable to be globalized. Mass-production of elements of systems and globalized transportation methods are still vital for passing relevant building blocks and knowledge to communities everywhere. The difference is in using those mass-produced elements in a meaningful way - a way that consciously connects to the site situation. What this requires is the spread of knowledge.

Education, then, is a second potential impediment to the endurance of landscaped architecture as a design language. There exists a vast range of knowledge related to the integration of landscape and architecture, but it is spread throughout various fields with few established channels for connecting the assorted pertinent information. Ecologists, botanists and landscape architects hold a great store of knowledge on natural ecosystems and individual species, which is greatly needed to figure out which species and which relationships function for landscaped architectural solutions. At the same time, historians, anthropologists and older generation practitioners may hold vast depths of indigenous knowledge for integrating local ecology and architecture. From any number of other disciplines, there is vast modern scientific research that is available and awaiting the connection to architectural concerns. As academics, professionals and practitioners continue to explore the impacts and mutually beneficial relationships that can exist between architecture and landscape, there will be an increased body of knowledge available for different varieties of ecological circumstances. The longevity of landscaped architecture as a design language is dependent on the gathering and continuation of this multi-disciplinary body of knowledge and its incorporation into design education.

Added to these impediments are the typical deterrents for changes to the construction industry: cost and codes. These types of practical restraints to change are not necessarily wholly preventative to the success of landscaped architecture, particularly if there is societal demand. They exist as hurdles on the path to full acceptance as a common design practice, but are already in the process of being challenged by design professionals worldwide. Only time will tell if the momentum for

the sustainability movement will continue. However, the belief of this author is that landscaped architecture has a great potential to be the design language for sustainability, acting as both a practical change in design and construction techniques that follow the values of environmentalism, but also as monuments that will last into the future as inspired architecture that represents this era of design.

Hawai`i is perhaps the most perfectly situated, both physically and historically, to lead the way for the rest of the country in the development of the articulation of landscaped architecture. The cultural atmosphere in Hawai`i is seeking to reestablish its cultural roots and also to become more resource independent and sensitive to the needs of the land. At the same time, Hawai`i is an iconic location worldwide for natural beauty that exists as an idyllic beacon for travelers everywhere. If Hawai`i is able to utilize its intrinsic natural resources within a contemporary design language that also progresses towards the goal of sustainability for the islands, it will certainly redefine its built environment as a shining example of how the values of environmentalism in contemporary design can be brought out within a unique sense of place. In terms of the rising trend for a landscaped architecture, and the need for a sustainable, ecologically driven architecture, Hawai`i has the potential to develop its own contemporary language of landscaped architecture and lead the way.

GLOSSARY

A

ABIOTIC : of or characterized by the absence of life or living organisms.[250]

AHUPUA`A : An ancient Hawaiian land subdivision reaching from mauka to makai.

`AUWAI : Irrigation ditches formed into the land to divert water from streams and rivers into lo`i.

B

BERM : A man-made mound of earth.

BIOMIMICRY : A new science that imitates processes and designs from nature to solve human problems.

BIOPHILIA : The innate human affiliation for natural systems and processes.[251]

BIOSYSTEM : Ecological term for systems composed of biotic and abiotic components.[252]

BIOTIC : Of or relating to living organisms.[253]

C

CANOE PLANTS : Plants that were brought to Hawai`i by the original Polynesian immigrants.

CRADLE-TO-CRADLE : A cyclical design model that considers all materials as nutrients and eliminates the notion of waste. Products are designed with a life-cycle analysis so that all materials have a useful afterlife planned into the design.

D

E

ECOLOGY : The branch of biology that deals with the relations and interactions between organisms and their environment, including other organisms.[254]

ENDEMIC SPECIES : Species that evolved and exist in only one place.[255]

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[250] Random House Dictionary, s.v. "abiotic", www.dictionary.com (accessed November 25, 2011).
[251] Stephen Kellert, Judith H. Heerwagen and Martin L. Mador. *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*. (Hoboken, New Jersey: John Wiley & Sons, 2008), 3.
[252] Eugene P. Odum and Gary W. Barrett. *Fundamentals of Ecology, 5th Edition*. (Brooks Cole, 2004), 5.
[253] Random House Dictionary, s.v. "biotic", www.dictionary.com (accessed November 25, 2011).
[254] http://dictionary.reference.com/ (accessed October 28, 2012).

ETHNOBOTANY : A science combining ethnology and botany, studying the interrelationship of human culture and plants.[256]

F FLORICULTURE : The cultivation of flowering and ornamental plants.[257]

G GAIA : A scientific hypothesis that all living things actively manipulate and regulate the Earth's atmosphere.[258]

GENIUS LOCI : A guardian spirit that gives life to people and places and determines their character or essence.[259]

H

I INDIGENOUS SPECIES : Species found in more than one locale but established in a given place without human intervention.[260]

INTERIORSCAPE : The inclusion of garden plots within the interior of a building.

J

K

L LANAI : A Hawaiian word originally referring to an outdoor space covered by a simple post and beam structure. In modern times it has come to refer to any covered outdoor living space.

LAND ETHIC : A system of values for man's relationship with nature outlining standards for behavior in relation to the natural environment, originated in *A Sand County Almanac* by Aldo Leopold.

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[255] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), 4.
[256] Beatrice H. Krauss. *Ethnobotany of the Hawaiians*. Harold L. Lyon Arboretum Lecture Number Five. (Honolulu: Harold L. Lyon Arboretum, University of Hawaii, 1978), 3.
[257] Random House Dictionary, s.v. "floriculture", www.dictionary.com (accessed November 9, 2012).
[258] James Lovelock. *Gaia: A New Look at Life on Earth*. (1979; Rev ed., Oxford: Oxford University Press, 2000), 9.
[259] Christian Norberg-Schulz. "The Phenomenon of Place," in *Theorizing a New Agenda for Architecture, An Anthropology of Architectural Theory 1965-1995*, edited by Kate Nesbitt, 414-428. (New York: Princeton Architectural Press, 1996), p. 422.
[260] Isabella Aiona Abbott. *Lā`au Hawai`i: Traditional Hawaiian Uses of Plants*. (Honolulu: Bishop Museum Press, 1992), 4.

LIVING MACHINE : A device made up of living organisms of all types that function together in the performance of some type of work. They are designed along the principles evolved by the natural world in building and regulating ecologies.[261]

LO`I : Irrigated terrace, especially for taro, but also for rice; paddy.[262]

M MAKAI : A Hawaiian word meaning 'towards the sea'.

MAUKA : A Hawaiian word meaning 'towards the mountain'.

N NATIVE SPECIES : Species that were established without human intervention.

NATURALIZE : To establish a nonnative species in a region where it is able to reproduce successfully and live alongside native species in the wild.[263]

O

P PERMACULTURE : The conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter, and other material and non-material needs in a sustainable way.[264]

PHYTOREMEDIATION : A process of decontaminating soil or water by using plants and trees to absorb or break down pollutants.[265]

Q

R RAIN GARDEN : A landscaped depression that receives stormwater runoff and allows it to slowly infiltrate the groundwater table. They can be used to help mitigate flooding problems, filter out pollutants in the water, create habitat, as well as make aesthetic gardens.

REGENERATIVE DESIGN : A design process that focuses on the evolution of the whole of a system, engaging in continuous and healthy relationships through co-

[261] Nancy Todd and John Todd. *From Eco-Cities to Living Machines: Principles of Ecological Design*. Berkeley: North Atlantic Books, 1994), 167.
[262] Ulukau: Hawaiian Electronic Library. http://www.wehewehe.org/ (accessed November 23, 2011).
[263] American Heritage Science Dictionary, s.v. "naturalize", www.dictionary.com (accessed December 2, 2011).
[264] Bill Mollison. *Permaculture: A Practical Guide for a Sustainable Future*. (Washington, D.C.: Island Press, 1990), ix.
[265] Random House Dictionary, s.v. "phytoremediation", www.dictionary.com (accessed November 22, 2011).

evolution. The design process draws from and supports continuous learning through feedback, reflection and dialogue, so that all aspects of the system are an integral part of the process of life in that place.[266]

S –Z XERISCAPE : A landscaping method utilizing drought-resistant plants and water conservation strategies to conserve resources and create low or no maintenance landscapes.

[266] Bill Reed. "Shifting Our Mental Model – 'Sustainability' to Regeneration." Preprint of an article submitted for consideration in the Journal *Building Research & Information* (2007), http://www.integrativedesign.net/images/ShiftingOurMentalModel.pdf (accessed August 17, 2011).

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